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# PROGRESS IN FOREST RESEARCH

## 1939



U.S. DEPARTMENT OF AGRICULTURE      FOREST SERVICE  
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION  
STEPHEN N. WYCKOFF, DIRECTOR

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## THE PACIFIC NORTHWEST: A REGION OF CONTRASTS

Two States with 104 million acres of land bearing 42 percent of the Nation's timber supply and with but 2 percent of the population. A people deriving one-third of its income from the forests, and through its labor providing one-third of the lumber used in the United States, and three-tenths of that exported. Bustling industrial cities; leisurely rural hamlets. Humming sawmills giving life to thriving communities; silent sawmills surrounded by deserted villages. The western termini of transcontinental railroads; the eastern termini of transoceanic steamship lines. Rainfall insufficient for tree growth; annual precipitation exceeding 100 inches. Thick absorptive layers of duff; bare areas subject to erosion. Endless vistas of sparse sagebrush; impenetrable walls of undergrowth tropical in density. Once lush range depleted by overgrazing; a range gradually being rebuilt. Cattle and sheep competing with each other for range; wild game competing with domestic flocks for forage. Forest areas abounding in fish and game; forest areas devoid of game and blackened by fire. Areas requiring planting to restore productivity; areas restocking completely by natural means. Forest lands returning profits to the owners; forest lands reverting to public ownership for unpaid taxes. Net growths expressible only with minus signs; potential growths the highest in the country. Trees with high positive conversion values mingling with trees of negative value. The largest sawmills in the country; the greatest average distance from markets. Complete utilization; enormous waste. Refinement in manufacture to the nth degree; shipment of much of the product direct from the woods.

Such is the Pacific Northwest, comprising the States of Washington and Oregon. A region of superlatives and contrasts? Yes. And a region presenting innumerable problems in the management of forest and range resources so as to provide the greatest long-time benefits to its people and to the Nation. The problems have been recognized and solutions have been sought by many agencies; industry, educational institutions, State and Federal organizations. Among the latter is the Pacific Northwest Forest and Range Experiment Station, established in 1924. Its staff of trained technicians is maintained at Portland, Oregon, by the U. S. Forest Service, Department of Agriculture, to conduct research, compile facts, and advance plans for the efficient management, use, and restoration of these natural resources.

The objective is "sustained yield"

The chief objective of forestry, be it upon private or public lands, is to bring forest management practices closer to the ideal expressed by the term "sustained yield." The present is controlled by what we have; the ideal is measured by the social end in view. Desire to approach the ideal is inherent in everyone. Progress toward the ideal is retarded largely by what we do not know and by economic obstacles to applying what

we do know. The long-range task of research is to widen the scope of knowledge; the immediate task is to determine the most urgent obstacles and how they may be overcome. These are the objectives of the Pacific Northwest Forest and Range Experiment Station, and this report summarizes conditions in the region, the most pressing problems, and the contributions of the Station staff, particularly during 1939, toward their solution.

The basic forest problems are quite similar throughout the two States, enabling application of knowledge and solutions obtained in one place to similar situations in other places with little or no change. On the other hand, the Pacific Northwest is divided by the Cascade Range into two regions distinctly different in geography and economy. West of the summit lies an area of moderate to heavy rainfall, a mild climate, low elevations, and luxuriant vegetation, and characterized by forests of Douglas-fir, western hemlock, and associated species and an economy dominated by industry. East of the summit lies an area of scanty rainfall, rigorous climate, high elevations, and sparse vegetation, and characterized by forests of ponderosa pine valuable for timber production and essential as summer grazing lands, enormous expanses of sagebrush and grassland, and an economy dominated by agriculture. In spite of many forest problems common to both regions, each has problems sufficiently different to require separate consideration.

#### THE DOUGLAS-FIR REGION

The Douglas-fir region, extending from British Columbia to California and from the Pacific Ocean east to the crest of the Cascade

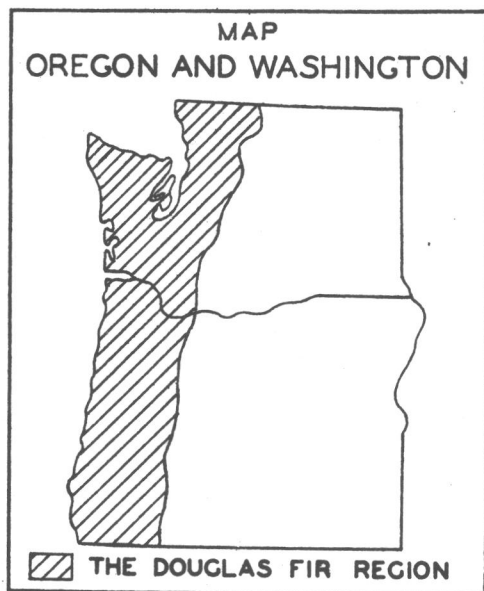


FIGURE 1.

Range, covers roughly one-third of the Pacific Northwest. Along the coast is a belt having high precipitation, foggy weather, and forests of western hemlock, Sitka spruce, western redcedar, and red alder, with stands of Port Orford white-cedar and Douglas-fir becoming important to the south. The species in this belt extend eastward into the Coast Mountains, becoming intermingled with Douglas-fir, and finally yielding largely to this species in the lowland territory comprising the Puget Trough in Washington and the Willamette Valley in Oregon. The eastern part of the region, the slopes of the Cascade Range, are characterized by forests in which Douglas-fir predominates at the lower levels, giving way to admixtures of hemlock, true firs, and other species at higher elevations.



From the standpoints of industrial development, timber depletion, and market outlets, the Puget Sound region in the north is in marked contrast to the Willamette Valley in the south. The former is more highly developed industrially, so far advanced in timber depletion that lumber production is decreasing sharply, and markets its forest products chiefly by water. The latter is not so highly developed industrially, relies more on agriculture, markets its forest products chiefly by rail, and timber depletion is in its infancy.

The forest resources are enormous and varied

Fortunately, the Pacific Northwest has accurate estimates of its forest resources. In 1930, the first work on the Nation-wide forest survey was inaugurated by the Pacific Northwest Forest and Range Experiment Station in the Douglas-fir region. The work has been completed, so that timber volumes and growth by species, forest types, geographic subdivisions, and ownerships are known. The data are kept current, a few counties a year, and are available for analysis of forest resource problems and their solution. During the past year, for example, 6 counties were resurveyed and reports issued.

Approximately  $82\frac{1}{2}$  percent of the total land area in the Douglas-fir region is forest land, and  $74\frac{1}{2}$  percent, roughly 26 million acres, is commercial conifer land. Practically all of this will remain available for forestry. More than  $14\frac{1}{2}$  million acres, or 56 percent, of the commercial conifer land bears forests of saw-timber size. Of this area less than half supports old-growth Douglas-fir forests and less than a fourth is comparable to the forests which supplied the bulk of past sawlog production.

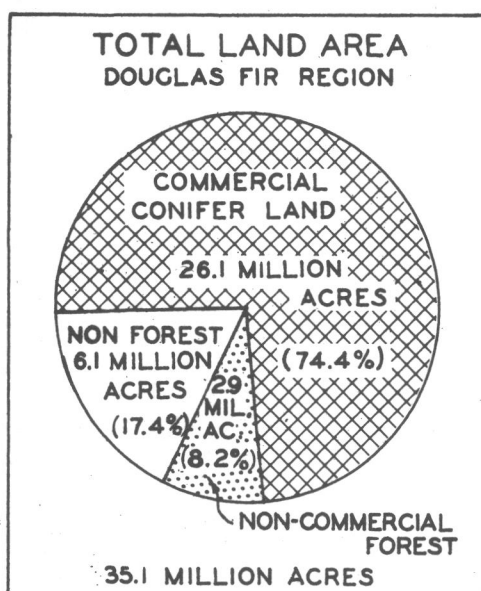


FIGURE 2.

These forest lands carry a present inventory of approximately 520 billion board feet, log scale, of which less than half is privately owned. Douglas-fir preponderates with a volume of 310 billion feet consisting of 130 billion feet of large old growth, 97 billion feet of small old growth, and 83 billion feet of second growth. About 37 billion feet of spruce and cedar has a definite commercial value, while of the 102 billion feet of western

hemlock large quantities have little present commercial significance. Other species total 71 billion feet, much of which is of doubtful commercial value.

Depletion is 8.3 billion feet annually

The forests of the Douglas-fir region are being depleted at the rate of 8.3 billion board feet annually; cutting of saw timber accounts for 7.9 billion board feet annually. In contrast, current annual growth totals approximately 2.4 billion board feet, and potential annual growth should be in the neighborhood of 8.2 billion board feet, provided old-growth stands are successfully converted to second-growth stands. The data show the ultimate sustained-yield capacity of the region to be about 8 billion board feet annually. Before this can be attained, however, there will be a period of transition from liquidation to sustained yield during which a cut of from 6 to 6½ billion feet per year is the maximum allowable.

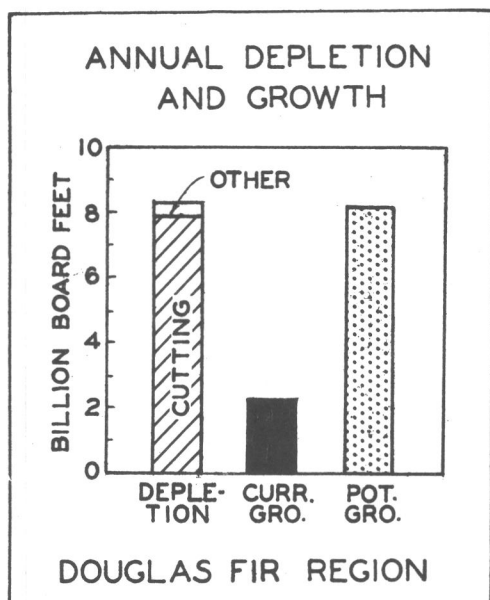


FIGURE 3.

for the first time in history, Oregon's lumber production exceeded that of Washington. Because of manufacturing facilities already established, and not transferable without considerable monetary loss, the Puget Sound industries are drawing an increasing proportion of their log requirements from Oregon. At the same time there is a growing tendency for new mills and plywood plants to locate in the Willamette Valley to be nearer the source of log supply.

Pressure to liquidate contributes to the problem

Since 1929 the depletion from cutting alone in the Douglas-fir region has averaged 7.9 billion board feet annually, decidedly in excess of the allowable cut during the transition stage. One of the major problems is that of overinstalled sawmill capacity; overinstalled when compared to either growth or markets. Many factors contribute—lack of industry control of new units, taxes, privately owned timber in blocks too small to permit sustained production—but probably the greatest is pressure to liquidate overmature virgin timber. Old-growth timber produces a high proportion of low-grade lumber which is a drug on a market reached only by long shipments. The unprofitable low grades reduce returns on the better grades, tending to make the whole operation unprofitable. The industry markets an appreciable part of its output in the form

of logs or in a partially manufactured state, partly because markets are remote, partly because most shipments are by water, and partly because of industry inertia. This problem has not been attacked by public agencies; perhaps it should be. The development of greater refinement in manufacture would eliminate freight now paid on unusable material, would permit greater utilization of low-grade material, and would increase regional income and buying power.

These problems and others resulting directly from past exploitation of forest lands are laid at no one's door. They are the product of a past philosophy of value and use of natural resources. It must be remembered that originally all forest lands were in Federal ownership; the present ownership pattern is the result of Federal grants, homestead laws, and other Federal timber and forest acts. When forest lands passed into private ownership only one value was recognized, the commercial value of the forest growing thereon. In removing this growth the operator had one objective in view, to obtain the maximum pecuniary return. This inevitably led to the destruction of other values of public concern not then recognized but which have since become important.

#### Early logging was selective

Early logging in the region was highly selective. Markets were limited by a sparse population and poor transportation facilities, and only high-value trees in the most accessible locations could be profitably harvested with the primitive equipment available. In the days of the jackscrew only trees within a short distance of water could be handled. The ox-team logger widened his sphere of action somewhat. But not until the introduction of the steam donkey and the logging railroad did timber exploitation really get under way. That this coincided with increased demand and widened markets through the settlement of the West Coast and the completion of transcontinental railroads was of far-reaching effect on

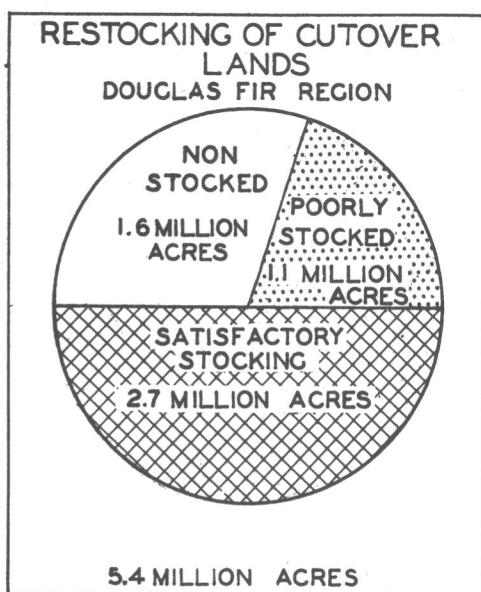


FIGURE 4.

the forest resource. Heavy equipment designed for handling big timber was developed and two adverse factors appeared; excessive cost of logging small sized timber with such equipment, and complete destruction of trees not economically removable. Mass production was necessary to obtain low costs; future values were sacrificed. Some of the most pressing current problems of forestry are the direct consequence of this phase of logging. The region now has 1.6 million acres of nonrestocked cut-over land, 1.1 million acres of poorly stocked cutovers, and only 2.7 million acres of satisfactorily stocked second growth. Non- or poorly stocked cut-over lands result quite largely from widespread clear cutting and subsequent



broadcast slash burning, abetted by recurrent fires which destroy seed trees and any reproduction which might remain or appear following logging. On many such areas it will be necessary to resort to expensive planting before they can be restored to production. In the coastal fog belt where hemlock, spruce, and cedar are important species the problem may be solved with less expense than on areas where Douglas-fir should be fostered.

#### Reforestation of cut-over lands studied

Past work at the Station has shown that broadcast seeding of the small-seeded species in the coastal belt is feasible, but that present methods of broadcast seeding of the large-seeded species is unprofitable because of rodents. Adequate rodent control over extensive areas is difficult. There is urgent need for additional research in broadcast seeding. One possibly fruitful field of investigation is that of the use of new or recently cheapened chemical compounds to be used as poisons or repellants. Most of the studies of artificial reforestation by planting have been conducted by the Regional Forester's staff in connection with extensive planting on national forests. The search for species especially adapted to certain purposes has been continued by trial of exotics in various places, particularly in the arboretum at the Wind River Experimental Forest. One especially interesting result is that Port Orford white-cedar, a valuable specialty species, has shown unusual freedom from rodent damage to both seed and seedling when planted well beyond the limits of its natural range. Recently developed hybrid poplars have been out-planted and are being studied with interest in the hope that they may excel in growth and in pulping characteristics. A test of Douglas-fir and ponderosa pine from varying localities has been under way for years for the purpose of determining superior races and strains suitable for artificial reforestation.

#### Fire research profitable

Fire is one of the important problems in the region, both in uncut forests and on cut-over land. Presence of slash and conduct of logging operations in high hazard areas greatly aggravate the problem. Two phases have been investigated by the Station--fire behavior and fire control. The work began some years ago with emphasis on the recognition and measurement of dangerous fire weather as the principal variable factor influencing fire behavior. Through a process of evolution, satisfactory low-cost instruments for measuring various elements of fire danger and a fire danger rating system now used on the national forests and elsewhere in the region have been developed. Fire danger rating is still in an active state of evolution. A new burning index table developed by the Station in 1939 is being tried on the national forests. During the year a statistical study was made of the number of stations required to obtain acceptable degrees of accuracy. Recently there has been a country-wide movement in favor of the development of a national fire danger rating

scale. The study of the rate of spread of fires under different fuel and terrain conditions was continued during 1939 with field observations on seven large fires.

Methods which have been developed for rating fuel hazard have been improved during the year, particularly as they apply to partial-cut areas. Studies have been made of factors affecting the rate of hand-constructing fire line. It was found that efficiency diminishes inversely with crew size. A 15-man crew averaged 0.49 chain of line production per man per hour; a 75-man crew only 0.20 chain per man per hour.

During the past 10 years various analyses of fire records made as the basis for planning presuppression and suppression activities, principally on the national forests, have been used in planning improvements, such as roads and lookout stations, and in determining the number and placement of guards. Studies of the detection system and its problems led to the development of the haze meter and colored eye glasses for lookouts. This year, at the request of the Forest Research Council, attention was directed to means of bettering protection on private lands, in the belief that the weakest link in the protection system is control of fires on logged-off lands, located chiefly outside the national forests. Snohomish County, Washington, was selected as a representative study unit. The physical and economic factors of fire protection have been analyzed and the results discussed with land owners, State officials, and protective association representatives. The next step is to draw conclusions and make recommendations for improvements in fire protection.

Logging trends during the past decade have been away from heavy equipment and from large, clear cuttings even when heavy equipment is used. The practice of clear cutting in strips or blocks so that no part of the logged area will be without a natural source of seed supply is being adopted in some operations and tree selection in others. Hence, from logging alone, there should not be an increase in the extensive non-restocked areas; however, such areas may result from fires. Loggers are adopting lighter and more mobile equipment, and are finding it economical. Tractors and auto trucks permit greater selectivity in logging, whether this be tree selection or area selection. Only trees known to be profitable at the time need be logged. The remainder can be left until increased size, increased quality, increased prices, or a change in market requirements render them marketable.

#### Selection presupposes knowledge of tree values

Intelligent selection of trees to be cut or left is predicated upon advance knowledge of present and future values. This Station has used as the net value of a tree the sum of the values of the logs it will yield minus the cost of logging, transporting, and milling these logs. Logging costs for different types of equipment under different

topographic conditions were established a few years ago but need revision and amplification because of changes in methods and equipment. Log values are determined from mill production studies, explained more fully under the discussion of east-side problems. No mill studies have been made in Douglas-fir; such studies are urgently needed. Coincident with such studies, which will be made as soon as funds and personnel permit, a study of relative efficiency of sawmills as affected by equipment and size will be undertaken.

Valuable information on commercial log values and utilization, and on the relation between tree values as predicted on the stump and as determined by actual selling price of the logs in the open market was accumulated during 1939 in a study of installment cutting on a 160-acre tract.

Selective cutting in west-side forests has its attendant problems. Douglas-fir, the most desirable species at present, is not wind-firm, and partial cutting may lead to excessive windfall losses of residual trees. Many Douglas-fir forests have an understory of tolerant western hemlock. Selective cutting may convert such a stand into one in which hemlock predominates. Under present conditions hemlock is considered a less valuable species.

Selective cutting is being studied from several angles. Analyses indicate that costs are usually lower with the more modern equipment, but that on difficult terrain the lighter equipment may not be as efficient. In the belief that equipment has not yet reached its highest efficiency, studies on design and on new equipment possibilities are being undertaken by the Station in cooperation with the Region 6 equipment laboratory.

Another approach to the problem of selective cutting in Douglas-fir stands is by increasing the demand for the so-called inferior or minor species. Western hemlock, for instance, has admirable properties for some uses but is difficult to market in competition with Douglas-fir lumber. It is in demand by the pulp mills, but not by sawmills. A study conducted cooperatively by the Douglas Fir Plywood Association, the Forest Products Laboratory, and the Station will be undertaken in 1940 to determine the practicability, both technical and economic, of manufacturing high-grade plywood from western hemlock.

#### Production and utilization statistics important

The Station is constantly called upon for information as to sources of supply of many species in the region, and as to proper manufacturing, seasoning, and utilization procedures for these woods. Several hardwood species, red alder, Oregon white oak, bigleaf maple, and northern black cottonwood, have been the subject of articles and bulletins in past years. Data on other species, western paper birch, tan oak, Oregon myrtle, and Sierra juniper, are being accumulated as time permits.



Record is also kept of production, use, and price statistics of many of the forest by-products such as Oregon fir balsam, cedar leaf oil, and cascara bark. Those, together with accurate statistics on the production of lumber, logs, lath, and shingles obtained in cooperation with the Bureau of the Census, provide the basis for many of the regional plans prepared by this and by other public agencies.

#### New management problems coincident with partial cutting

The silvicultural aspects of the changed logging methods and the trend toward partial cutting loom high in the Douglas-fir region. The problem has been recognized by the Station, and permanent sample plots have been established whereon results of partial cutting on growth, mortality, fire hazard, and logging injury may be observed and quantitatively measured over a period of years. It is too early to draw conclusions, because the heterogeneity of conditions in the region make necessary large samples and long-continued observations to smooth out normal variations.

Another factor in partially cut stands and one which will determine the choice of a selection system is the silvicultural requirements of the species. How much light is required for regeneration and for the proper development of seedlings? How large an opening must be made in the canopy to insure maximum requirements? The light requirements are being measured in slat houses at the Wind River Experimental Forest where light may be regulated and under tree canopies of various densities.

The Port Orford white-cedar type in the extreme southwestern part of the region offers peculiar and special silvicultural and utilization problems. The species is important because of its scarcity and high value. An experimental forest established by the Station in this type near Powers, Oregon, has been unoccupied this year because of lack of personnel. Likewise, practically nothing has been done this year on the study of silvicultural problems in the spruce-hemlock type and the alder type so characteristic of the coastal fog belt. The Cascade Head Experimental Forest, near Otis, Oregon, is being developed to study these problems more intensively. Problems in these types have points in common with those of the Douglas-fir types but must be solved through the development of special techniques.

Another problem created by logging is that of the management of second-growth stands. The future depends upon these stands, because eventually the bulk of the virgin growth will be converted to second growth. Undoubtedly, it will never be profitable to grow Douglas-fir to the sizes and ages now harvested. This species is slow to prune its bole of dead branches; obviously, artificial pruning will be necessary if clear lumber is to be produced on short rotations. The time may not be far distant when pruning will be economically justified. A study has been made by the Station of pruning under natural conditions, and pruning

operations conducted by CCC crews on a number of localities have been observed. Other stand improvement practices such as thinning may be profitable in second-growth stands. In order to determine the silvical effects of various types of thinnings, seven permanent sample plots were established on the Wind River Experimental Forest following a sale of piling from a second-growth stand.

Additional data on the life cycle of even-aged Douglas-fir stands are being obtained from periodic measurements on many permanent growth plots. These furnish a check on normal yield tables previously prepared by the Station. This year's measurements of 25 plots confirm the conclusion that both overstocked and understocked stands trend toward the normal. Information is needed, however, on growth in uneven-aged stands, in mixed stands, or following partial cutting. And the important problem of quality growth is still unanswered.

The utilization phases of second-growth fir should be analyzed as soon as possible. Logging in immature stands will differ from that in mature stands, and costs at hand for the latter are not applicable. Milling procedures and costs must also be established. A few preliminary time studies and lumber-grade recovery analyses have been made. More detailed studies must be preceded by the development of a set of log grades adapted to second-growth Douglas-fir--a system of grades analogous to those developed for ponderosa pine. At present the mills cutting second growth are usually underfinanced and underpowered, and are at a disadvantage in the marketing of their products.

Many of the problems so far considered are symptomatic, not causal. Each may be isolated for study, but the improvements suggested by such studies can be but alleviatory. Until the underlying causal problem is revealed and studied and until the improvements suggested by studies of the isolated parts are correlated with the causal problem, we are but nibbling the edges of the great forest resource problem in this region.

#### Change in philosophy of natural resource use

Basically, the present problem results from (a) damage accumulated under an old philosophy of resource utilization and (b) the failure of the economic structure to recognize that this philosophy is outmoded. Briefly, the old philosophy held that a natural resource should be "mined" for the creation of wealth; the new philosophy holds that the creation of physical wealth should be correlated with the derivation and maintenance of full social values from these resources. The second is a mature development of the first encouraged by the trends of settlement and development. Whereas in the early days there was an apparently inexhaustible reserve of forest resources in this region and it was logical to exploit it in order to provide the wealth for developing the country, it is now realized that these resources are exhaustible, that

their perpetuation is necessary to the well-being and security of this and of future generations, that remaining resources must be wisely used and maintained, and that those which have been depleted or destroyed must be restored.

#### Taxes and land use highly correlated

During the early days of forest exploitation, taxation problems, for example, were inconsequential or nonexistent. The resource was boundless, the needs of the sparse population few. Cut-over land was sold or even given away to settlers. Most of this was suitable for agricultural use because logging was restricted to the bottomlands. As logging progressed the taxable resource decreased, but population increased and its demands for service became more and more insistent. Logged-off lands were still sold for farming, but they were less suited to this use--they were primarily forest land. The deeds to these lands were merely invitations to failure, loss, a low standard of existence to the owner, and additional burdens upon the community for services. Continued cultivation of such lands contributed to erosion and soil deterioration. Cut-over lands no longer found a ready market, partly because they were of poor quality and partly because the wave of settlement had subsided. The logger could see no future value in them and allowed them to revert to the county through nonpayment of taxes. But the county had no use for them, had no provision for administering them, and made every effort to sell them, usually at low prices, in order to bolster decreasing assessment rolls. The cycle was complete; the income-producing resource had been reduced, population had been increased and dispersed hither and yon in the hinterland, demands for service increased all out of proportion to the values and income created, taxes on the remaining resource increased until finally the burden became so onerous that even the virgin resource is reverting to public ownership at an alarming rate.

#### Tax delinquency studied

Recent studies indicate that between 1933 and 1938 there was a 54 percent increase in the acreage of forest lands involved in long-term tax delinquency and reversion to public ownership. The situation is far more critical in the highly productive Douglas-fir region than in the pine region. Though the principal trouble spots are deforested lands and lands bearing second-growth stands of less than saw-timber size, an amazing amount of virgin timber and a considerable acreage of residual old growth from which only the high-value trees have been removed are also involved.

Two of the immediate problems of the region are (a) what to do with these forest lands being forfeited to the public for unpaid taxes, and (b) what may be done to stem the flow of tax delinquency. The Station is approaching these through studies of the extent, causes, effects, and possible cures. Investigations reveal that the existing situation

is symptomatic of fundamental breakdowns in private forest land ownership and is in part traceable to management practices under existing economic conditions. No one remedy will cure the situation--no panacea exists. However, measures have been found which may be applied with remedial results and which may pave the way for the development and application of additional remedies and eventually reduce adverse pressures sufficiently to permit self-correction. Some of the wasteful processes of the past may be averted by classifying tax-forfeited lands as to best-known long-term use and ownership; public sale of those best suited to private ownership, and public ownership and management of those suited best to public ownership. The flow of delinquency will not be stopped but may be retarded by economies in local government, improvement in tax administration, and modification of property tax laws in keeping with the deferred income nature of forest properties. It should be remembered that as long as social order is maintained there will be taxes, as long as there are taxes there will be tax delinquency. Our efforts should be directed to reduction of wasteful processes and retardation of delinquency.

Among the serious problems of the private forest owner is the unpredictability of the property tax. Investigations reveal wide variations in tax rates from year to year. Although this condition creates hazards in ownership of all classes of property, it creates unusual hazards in the case of forest properties and to the practice of private forestry. If property taxes, which take a substantial proportion of gross income from a forest property cannot be predicted, then liquidation is favored and stable private ownership discouraged. Studies in progress reveal that local government may be adapted to forest use in the forest areas of Washington and Oregon and that by so doing taxes can be made more predictable without impairing governmental efficiency in these or contiguous areas. Other economic studies needed are: (1) assessed valuation with particular reference to deferred yield properties; (2) deferment of tax payments in keeping with deferred income nature of forest properties; and (3) the nature of the forest investment in this region under various existing and future local, national, and international forest situations.

#### New forest values recognized

In keeping with the transition from a philosophy of timber mining to one of recognition of the full public interest in forest resources is the initiation of studies dealing with forest values other than timber production. Since the Station was founded it has not been possible to divert resources from studies dealing with the many and complex problems developing from forest growing and cropping to the problems connected with the indirect forest uses. Recently attention has been directed, partly by disasters and partly by forward-looking agencies, to the stupendous and irretrievable losses of soil and downstream damage through water and erosion stemming from misuse of land. A program of flood control surveys is commencing in this region. It will include an investigation of the way forests act to prevent flood damage and soil



losses on specific critical watersheds. Participation of this Station in the cooperative program of flood control surveys launches it on a new era of forest research with greater responsibilities and greater opportunities. It marks the departure from studies limited to direct use of the forest resource for studies that recognize the complete social use of forests.

### THE PONDEROSA PINE REGION

Domination of the geography of Oregon and Washington by the Cascade Range has created east of the summit an area totally different in climate, vegetative cover, and economy from that on the coastal slope.



FIGURE 5.

This area, known as the ponderosa pine region, is characterized by vast expanses naturally treeless because of insufficient rainfall, mountains with an open park-like forest cover, and extreme seasonal and diurnal climatic variations which because of a limited growing season create an entirely different set of physical factors in the forest problems. Exclusive of three counties in northeastern Washington, which for administrative reasons are not included in the territory of this Station, the ponderosa pine region has an area of 65 million acres, only one-third of which is forest land, in sharp contrast to the Douglas-fir region where seven-eighths of the total area is forest land.

The treeless two-thirds of the region is made up of intensively farmed, irrigated orchard and crop land, wheat land, grass-covered range land, and sagebrush plains. The economy of the region is largely rural, and agriculture is the principal source of livelihood. Water is the key factor in agricultural land use and its presence or absence dictates the type of agriculture. It is only natural that multiple use of forest land should find full expression here. Agriculture and forestry are in harmony and conflicts between these two primary uses of land are inconsequential. The forest research program of the Station is being shaped to fit these conditions. The two major forest land uses are timber production and forage production. Despite the close integration of the two they will be considered separately here to facilitate discussion.

## Ponderosa pine the important timber species

The forest land in the ponderosa pine region as shown by the forest survey covers 22.1 million acres, of which 16.2 million acres is

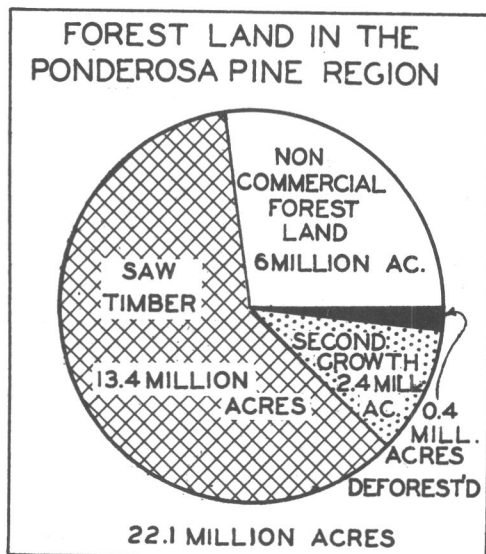


FIGURE 6.

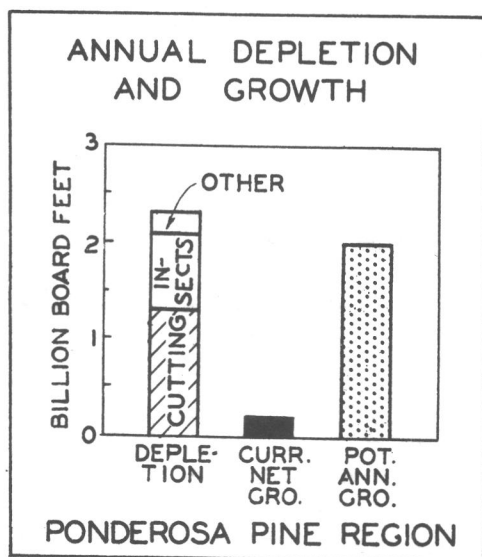


FIGURE 7.

commercial forest land. Of the latter, 83 percent is occupied by forests of saw-timber size, 15 percent by second-growth stands less than saw-timber size, and the remainder is deforested. Ponderosa pine, the predominant species, covers 10.4 million acres in stands of saw-timber size, and 1.4 million acres in second-growth stands. The total saw-timber volume in the region is 127.1 billion board feet, of which 64 percent is ponderosa pine. The other species are of low commercial value, and their utilization is an important problem.

Current annual depletion from all causes is estimated by the forest survey to total 2.3 billion board feet divided as follows: cutting, 1.3 billion; insect loss, 0.8 billion; fire and wind throw, 0.2 billion. Current annual net growth totals 219 million board feet, and potential annual growth under intensive management is computed to be approximately 2 billion feet. If the best type of selective cutting is universally adopted an allowable cut of 1.1 billion board feet is possible from the pine types alone, which approximates average annual sawlog depletion for the 1925-36 period. The ultimate sustained yield is 1.4 billion board feet from the pine types. Region-wide the situation is not seriously unbalanced, but certain units, Klamath Plateau and Deschutes River, are heavily overcutting.

## Selective cutting well advanced

Timber exploitation in the pine region is not of such long standing and has not been as devastating as that in the Douglas-fir region. So-called clear cutting was the rule in the early days, but this meant

the cutting of trees above 12 inches or 14 inches stump diameter. Many of the residual trees remained because slashing fires are not as intense and as extensive due to lighter stands and less debris. So except on areas recurrently burned, a certain degree of restocking, not always satisfactory, of course, has been attained. Some operators still follow these practices. Beginning in the late 1920's there was a tendency to scrutinize tree values more closely and to cut only those with positive margins. A 16-inch tree was found to be the smallest that should be cut. Since then many operators have followed this zero-margin cutting policy, with diameter limits varying between 12 inches and 20 inches, depending upon market conditions. The result is removal of 75 percent of the stand volume and gives expectation of a second cut in approximately 60 years. The Forest Service policy has been to mark 80-85 percent of the volume, and to require brush disposal usually by spot-burning.

Beginning in 1935 the Station developed and advocated a selective cutting system, called the economic-maturity system, in which present and future values formed the basis for decision as to which trees to cut. Economically mature trees, i.e., those with a low earning capacity as shown by growth rate and quality increment, were selected for removal in the first cut, leaving in the residual stand only those trees with the greatest earning capacity. Analyses of several stands indicated optimum returns to the operator when removing from 30 to 50 percent of the volume. Coupling this with the adoption of the best use of tractors and trucks, a considerable increase in returns per thousand feet was indicated. At the same time, an area was opened twice as fast, permitting conversion of stands with negative growth rates into producing units at twice the old rate, and permitting the salvage of insect or fire-killed trees when necessary. It is also believed that under the economic-maturity selection system most of the insect-susceptible trees are removed, thus reducing losses from this source. The system is finding favor with private operators and with national forest administrators.

#### Knowledge of log and tree values essential

The determination of tree values is predicated, according to procedures adopted by this Station, upon a knowledge of the value of the logs into which they will be cut, and this in turn is predicated upon a system of log grades applicable to standing timber as well as to logs. A set of grades, based entirely upon external characteristics, has been developed. Lumber-grade recoveries from logs of these grades have been established by intensive mill production studies. Analyses have been made of timber from widely separated localities within the region, and from one locality in Arizona, and under the range of manufacturing procedures encountered within the region. Each of the six log grades in this system yields characteristic lumber recoveries, the differences in recoveries being attributable to manufacturing practices rather than to inherent differences in the timber from which the logs came. Publication of the mass of material pertaining to these log grades is being

deferred pending integration with a newly proposed set of grades applicable throughout the range of ponderosa pine. This new system resulted from a conference called late in 1939 by the California Forest Experiment Station, and also attended by representatives of the Northern Rocky Mountain Forest Experiment Station and this Station. To date, no studies in which the new grades were used have been made by any of the three stations.

Coincident with the analyses of grade recoveries and selling values of the logs, time studies were conducted in order to allocate correctly milling costs against logs of different sizes and qualities. Time studies of the woods operations have also been made, so that the Station is in position to analyze conditions and predict results under any of a variety of conditions.

#### Silvicultural problems studied

Because of climatic and species conditions, the silvicultural problems in the ponderosa pine region differ from, but are no less important than, those in the Douglas-fir region. Pringle Falls Experimental Forest and the Blue Mountain Experimental Forest have been established as research centers in this region, though sample plots are scattered throughout the timbered area. One of the main problems being studied is that of mortality in selectively cut stands. This year's annual check of 520 acres cut by seven different methods of selection at Pringle Falls showed a loss of only 4 trees of saw-timber size--a small loss out of 5,000 trees. On 50 miles of transects on the Malheur National Forest, cut by the maturity selection system, there was a loss of 59 board feet per acre during the past year.

Stand improvement in the ponderosa pine region promises to pay dividends, and the technique for such improvement work is now being developed. Using CCC labor, crop-tree pruning and thinning have been conducted on a number of areas, and records of costs have been obtained. Among the 23 permanent sample plots remeasured this year at Pringle Falls, 3 were in lodgepole pine thickets, 2 of which had been thinned. Mortality on the thinned plots was half that on the unthinned check plot; net annual growth on the thinned plots was from four to eight times that on the unthinned plot.

#### Forests and summer range are correlated

The range in this region is a virtual empire of 62 million acres of grazing land over which grass and water rule. More than 125 million dollars is invested in land, livestock, and equipment in the region and annual expenditures for feed, fertilizer, and labor amount to 10 million dollars. Capital assets of the industry include 2 million range sheep, 375 thousand range cattle, and 6,500 home ranches. Profits are curtailed by service costs on mortgages on many ranches.



Owing to the long transcontinental trek to markets and unstable prices of lamb, wool, hides, and beef, the industry in this region is totally dependent on a yearly abundance of the cheap nature-endowed range forage crop as determined by occurrence of spring rains, summer drought, and winter snow in its competition with the pasture and feed lots of the Midwest and corn belt.

Unlike forest industries, the range livestock business is dependent on a crop that grows, matures, and is harvested annually. Drought, especially when the range is heavily stocked, reduces the year's forage supply below the amount needed to maintain the grazing animals. Wholesale and ruinous selling, starvation of livestock, or the purchasing of costly feed supplements, any of which is destructive to the economic welfare of the graziers, occurs when range forage supply sinks below the level of demands made by the grazing herds.

Of still more serious consequence is the damage done to the range resource during years of overdemand. While graziers are waiting for rains that fail to come, or for increase in prices that changes loss to profit, the range forage is overused, its roots are starved from close cropping of the food-manufacturing leaves and stems, plants die, fertile soils once safely root-bound wash or are blown away, fewer and less valuable range plants remain, and the dimension of the feed resource for range sheep and cattle thereby is semipermanently reduced. Regardless of current opinions that feed now "short" will return in abundance with future rains, rebuilding of the forage resource on ranges seriously depleted by drought and heavy grazing is a slow, tedious process. If destructive erosion has occurred, rebuilding may require generations.

The function of the Experiment Station is to obtain a constructive solution to this viciously circling problem. A solution based on sound economics, yes; but a solution that also will deal intensively with the best long-time management of the soil and the forage resources. Permanent stability in the range livestock business rests on a healthy condition of the basic resource.

What are safe levels of stocking?

The Station is interested in determining safe levels of stocking range lands that will avoid undue forage waste in years of abundant moisture and at the same time prevent range destruction in years of rainfall deficiency. To do this, minimum requirement for perpetuation of important range types and key forage species under grazing use must be determined. Ways and means of revegetating depleted ranges either naturally or by artificially reseeding must be found. Above all, managerial methods that are successful in respect to the grazer, to the grazing animals, and to the range resource must be developed.

Solution of the summer-range problem is the key to a large part of the regional range problem. The summer range, limited to mountainous areas, is most usable and available when summer drought has dried

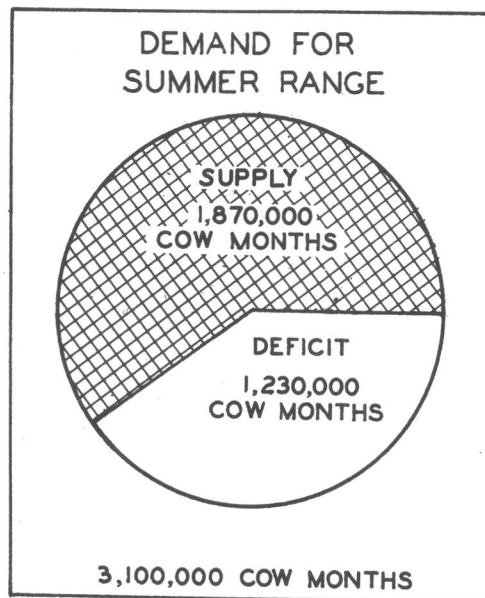


FIGURE 8.

up waterholes and parched feed on lower sagebrush and grassland ranges. Mountainous range lands in Oregon and Washington can safely carry for the summer period not more than 70 percent of the livestock that is supported on semiarid ranges or in feedlots during the remainder of the year. This shortage results in heavy use of summer range, which in turn results in lowered production of summer range forage, thus further unbalancing the seasonal range forage supply. Moreover, accelerated erosion bespeaking lowered ability to grow forage, and rapid run-off inimical to a dependable supply of usable irrigation water, accompanies the reduction of plant cover that results from harmful grazing on these steep lands.

Despite the great values involved, the summer range forage crop has been harvested for many years without adequate knowledge of the requirements necessary to sustain or increase the yield or to protect the soil from accelerated erosion. To determine these requirements, quantitatively and qualitatively, is the first step that the Station contemplates towards a constructive solution to the range problem.

Summer range in Oregon and Washington is more than 90 percent timbered. The small acreage of untimbered range mostly at elevations near timberline and in mountain meadows, however, is potentially high in grazing capacity in relation to the timbered range. Investigations indicate that these choice open ranges have been seriously depleted because of their desirable species and the ease of livestock management in grazing them. It is estimated that if these open ranges could be restored to their original capacity, a substantial amount of the present discrepancy between grazing capacity of summer and other seasonal ranges could be eliminated.

Overgrazing is detrimental

Studies indicate that untimbered green fescue summer range in prime condition will support 5 sheep months' grazing per acre; in average depleted condition only 0.5 sheep months per acre. This loss in grazing capacity results from a lowered plant density of from 62 to 83

percent and, more important, a loss of more than 90 percent of green fescue, which furnishes the bulk of the feed even on depleted ranges.

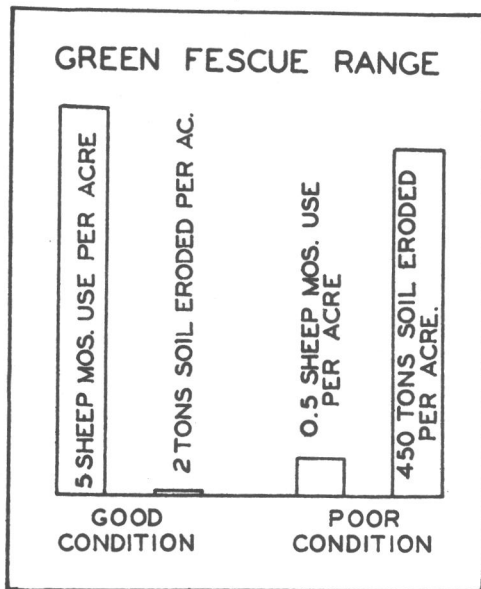


FIGURE 9.

In addition, there may be a loss of approximately 450 tons of fertile topsoil to the acre from accelerated erosion because of the wholesale destruction of the deeply rooted green fescue. Chief of the invading species on depleted green fescue range are the shallow-rooted needlegrasses and weeds such as horsemint and fleecflower, poor forage species ill-equipped to arrest accelerated soil erosion. These plants in virtually the same amounts and association are to be found on ranges that formerly were thought always to have been needlegrass-weed ranges.

In view of the foregoing study, it is a valid argument that needlegrass-weed ranges, if not definitely proven to be retrogressed from a more stable climax vegetation such as green fescue, should be considered to be in a developmental stage, unstable as to soil-

vegetation balance and worthy of careful management in order to promote better range and watershed conditions.

From utilization studies on these two range types it is tentatively concluded that green fescue should not be used closer than 50 percent of its current herbage production under any circumstance; that when this use is made of the fescue, associated needlegrasses are used only to 15 percent of their foliage production. On needlegrass-weed range the use of the needlegrass herbage to from 40 to 60 percent, such as is common practice, should be discouraged if the type is to be allowed to build up. Probably not more than 15 percent use of needlegrasses, and certainly not more than 30 percent, should be countenanced if the range is to be rebuilt.

Exploratory studies on timbered pinegrass ranges that form the bulk of summer range in Oregon and Washington indicate that up to 50 percent of the forage comes from small meadows that may constitute as little as 4 percent of the area. The forage from the timber feed proper, moreover, is observed to come in large measure from relatively sparse species such as lupine and vetch. Therefore, it is tentatively deduced that grazing management of pinegrass range should be based not on the low-value pinegrass which ordinarily makes up a large percentage of the vegetation, but on small areas of meadow clothed with choice forage plants and upon

the good forage species that grow sparsely in association with pine-grass under the timber canopy.

#### Wise range utilization standards essential

In developing standards for wise range forage use, or for estimating range grazing capacity, or for checking range utilization, it is essential that the measuring sticks used are calibrated. The Station has devoted considerable effort along these lines and has found that, in general, variability of range vegetation is such that more than 10 percent accuracy in measuring it is not ordinarily to be expected. To obtain this accuracy in estimating plant density and composition with a 2 to 1 probability of successful repetition requires about 125 sample plots on subalpine grassland types and about 225 plots in the timbered pine-grass type. This means that an area of from 6 to 10 sections sampled at the intensity of 20 plots per section is required to obtain estimates within 10 percent accuracy limits. If similar accuracy is desired on smaller acreages, more plots per section must be taken. Percentage utilization of range species may be estimated dependably with from 25 to 50 plots.

It was found that personal error of estimating range forage when divorced from errors due to inadequate sampling is also approximately 10 percent and that individuals tend to estimate consistently higher or lower than the true values. The individual estimates, whether high or low, were found to be equally consistent and of relatively the same accuracy, however. It is concluded that personal error within a crew can be nullified largely by scheduling each day's work so that all crew members are involved in making the estimates of the unit worked on that particular day.

#### First flood control survey in the region

It is fitting that the first detailed flood control survey undertaken by the U. S. Department of Agriculture in the Pacific Northwest should be on the Walla Walla River Watershed. This area contains both forest and range land with conditions varying from complete cover to almost an absence of cover. Its waters irrigate some of the most intensively cultivated farms in the region, and annual flood damage is excessive. Because of the recent establishment of flood control studies at the Station no specific contributions can be mentioned.



## SUMMARY OF 1939 RESEARCH

### Forest management research

A large-scale experiment in installment cutting in old-growth Douglas-fir and hemlock was made to determine silvicultural damage and effect on fire hazard of each of five degrees of cutting. After the first cut 5 percent of the reserved Douglas-firs and 19 percent of the hemlocks were injured, after the second cut 11 percent of the Douglas-firs and 32 percent of the hemlocks were injured, and after the third cut 15 percent of the Douglas-firs and 36 percent of the hemlocks were damaged.

Instruction in methods and tools for thinning and pruning Douglas-fir and ponderosa pine forests were given 10 foremen and hundreds of CCC workers through demonstration and training on 10 national forests. The "Hebo Club", a simple instrument adapted to rapid and inexpensive pruning was developed.

Information was released concerning effect of crew size upon man hour output of fire line, number of fire danger stations required per ranger district to get reliable fuel moisture and wind velocity averages for daily fire danger rating, and fuels most likely to be ignited by smokers. In the first-named study it was found that a 15-man crew would produce 0.49 chain of fire line per man hour and a 75-man crew but 0.20 chain per man hour. Improvements were made in fire danger rating specifications.

At the suggestion of forest protective agencies a study was initiated of the fire control system in effect on private lands, primarily to determine cost of effective protection.

Twenty permanent sample plots aggregating 72 individual acres, re-examined or established this year on partially cut areas, are beginning to yield results as to character of reserve trees compared to trees cut, logging damage, windfall incidence, insect loss, etc. For example, one area shows a loss of over 50 percent of the reserve stand in 3 years, while another shows a loss of less than 1 percent in the same period. In some cases removal of high-grade material only results in doubling cull percent of the reserve stand; in other cases the same selection practice does not deteriorate the reserve stand. This wide variation emphasizes the need for a large number of observations over an extended period.

### Range research

Erosion and grazing capacity losses measured. An acre of green fescue range in prime condition will carry 5 sheep per acre for one month; in average depleted condition 10 acres are needed. Depleted range

may have lost up to 450 tons of fertile topsoil per acre. Deep-rooted, highly palatable green fescue is replaced by shallow-rooted, poor quality needlegrass and worthless weeds.

Use of green fescue and needlegrass compared. Not more than 50 percent of green fescue herbage should be grazed under any circumstance. At this use intensity only 15 percent of admixed needlegrass is grazed. Needlegrass growing in the absence of green fescue should not be grazed to exceed 30 percent in the interest of range and soil conservation.

Forage use estimated with few plots. Use of a key forage species such as green fescue may be estimated on a grazing allotment with observations on from 25 to 50 impersonally selected sample plots.

#### Forest products

All previously conducted production studies in ponderosa pine mills brought to completion by preparation of the necessary reports.

A comprehensive mill production study of ponderosa pine grown in mixture with Douglas-fir initiated and completed. The high-grade logs were quite similar to the same grade in other studies using material from pure pine stands. All other logs were low line within their grade and showed lower pond margin values than were expected.

Regional lumber-grade recovery expectancies compiled on basis of the Pacific Northwest system of log grades.

The 1938 sawlog depletion was compiled by counties. Total for Oregon was 3.8 billion board feet; for Washington, 3.5 billion board feet.

The 1938 annual lumber census showed production 21 percent below 1937. In 1938 Oregon production was greater than Washington for the first time in history.

Arsenic paste preservative records on experimental pole lines show effectiveness of the treatment.

#### Forest survey

The preliminary draft of a comprehensive report on the forest resources of the ponderosa pine region of Oregon and Washington was prepared. It includes, in addition to inventory, growth, and depletion data, an analysis of regional timber supply and sustained yield possibilities. The report shows that if current production levels are to be maintained permanently pine forests must be rapidly converted to a growing condition best accomplished through light selection cutting and other types must be utilized.

"Volume Distribution in Saw-Timber Types in the Ponderosa Pine Region", Forest Research Notes No. 28, was published and distributed. The report gives the average volume per acre of each saw-timber type by survey-unit and State. It also gives volume distribution by diameter class of the two important ponderosa pine types. In both these types about half the volume is in trees over 28 inches d.b.h.

Field inventory revision was completed for 6 counties aggregating 4.1 million acres of forest land.

Published revised type maps of 4 counties and statistical inventory reports for 3 counties. The latter 3 counties--Pierce, Pacific, and Snohomish--showed a net depletion between the original inventory and the revised inventory of 4.7 billion board feet, or 10 percent.

Prepared manuscript report, "Forest Resources of Washington", for publication by Washington State Division of Forestry. The report shows, among other data, that the State has 290 billion board feet of standing timber and is exceeded only by Oregon in this respect.

#### Forest economics

The acreage of forest lands in Oregon and Washington tax delinquent for 3 years or more and forfeited for unpaid taxes increased 54 percent between 1933 and 1938, according to conservative estimates made in 1939.

Advice and information was given public and private agencies concerning tax delinquency, disposal of tax-forfeited lands, land classification, rural land planning, simplified county records, and remedial measures applying to land use.

Preliminary, unpublished studies of adapting local government to forest use in forest areas of Washington indicate possibilities of stabilizing property taxes in these areas without impairing governmental efficiency in these or contiguous areas.

A statistical study pertaining to the yield tax laws of Oregon and Washington was conducted.

Cooperation continued with national forest administration and a number of private operators in studies and experiments in selective cutting and related problems of logging economics.

The realization value of each of five installment cuts was obtained through detailed record of each tree's volume, log grade, and logging cost.

## Flood control surveys

Preliminary reports to determine the feasibility of flood control by land use practices which retard run-off and prevent soil erosion were prepared for the watersheds of the Nooksack, Puyallup, and Moses Coulee Rivers, Washington, the Willamette River, Oregon, and the Tanana River, Alaska. Flood damages on each of these watersheds warrant a detailed watershed survey to determine control methods best suited to flood protection.

Work outlines for watershed surveys were prepared for the Walla Walla River Watershed, Washington, and the Willamette River Watershed, Oregon.

## ACKNOWLEDGMENTS

The work of the Station during the past year has been materially advanced through the assistance of the WPA. The loyal and efficient services of a corps of office workers made available through a WPA project have enabled the technical staff to devote a larger proportion of their time to the analysis of results and the preparation of reports.

Credit is also due the CCC organization with whose assistance we have been able to man the experimental forests and make marked progress on thinning, pruning, and other stand improvement work.

## ADVISORY COUNCIL

The Advisory Council is a group of men, representative of the varied forest interests in the region, appointed by the Secretary of Agriculture to advise as to the problems which should be studied. These men, because of their knowledge of and practical association with the region, keep the staff in touch with the trends and needs of the forest users, and through their advice keep the work of the Station pointed toward practicality. The Council members serving during the past two years are listed below:

|                     |                   |
|---------------------|-------------------|
| E. T. Allen         | E. C. Manning     |
| C. S. Chapman       | D. T. Mason       |
| Donald S. Denman    | L. T. Murray      |
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## STAFF

### PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION

#### Director

Stephen N. Wyckoff

#### Technical

|                       |                           |
|-----------------------|---------------------------|
| Thornton T. Munger    | Principal Silviculturist  |
| Axel J. F. Brandstrom | Senior Forest Economist   |
| Sinclair A. Wilson    | Senior Forest Economist   |
| J. Elton Lodewick     | Senior Silviculturist     |
| Wade DeVries          | Senior Forest Economist   |
| Raymond H. Chapler    | Senior Forester           |
| Robert W. Cowlin      | Senior Forest Economist   |
| Gerald D. Pickford    | Senior Forest Ecologist   |
| Donald N. Matthews    | Silviculturist            |
| Leo A. Isaac          | Associate Silviculturist  |
| Herman M. Johnson     | Associate Forester        |
| Ernest L. Kolbe       | Associate Silviculturist  |
| Floyd L. Moravets     | Associate Forester        |
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| Warren H. Bolles      | Associate Forester        |
| William G. Morris     | Assistant Silviculturist  |
| Edward D. Buell       | Assistant Forester        |
| Eric A. Anderson      | Junior Forester           |
| Elbert H. Reid        | Assistant Range Examiner  |
| Theodore Kachin       | Junior Forester           |
| Douglass C. Welch     | Junior Forester           |
| Earl G. Dunford       | Junior Forester           |
| Morten J. Lauridsen   | Assistant Field Assistant |
| D. Lester Lynch       | Assistant to Technician   |
| Donald F. McKay       | Assistant to Technician   |
| Walter G. Petersen    | Assistant to Technician   |
| Edwin A. Erickson     | Assistant to Technician   |
| Charles Herold        | Assistant to Technician   |
| Bert C. Baker         | Junior Field Assistant    |
| Paul F. Liniger       | Junior Field Assistant    |
| William J. Allyn      | Junior Field Assistant    |
| Orville B. Cary       | Under Field Assistant     |
| Kermit B. Peterson    | Under Field Assistant     |
| Robert M. Porter      | Under Field Assistant     |
| Fremont McComb        | Foreman                   |
| J. Hollis Lenox       | Foreman                   |

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Edna L. Hunt  
Evelyn L. Berg  
Dorothy E. Rude  
Ruth E. Hickman  
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Leona M. Stevens

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Clerk-Stenographer  
Clerk  
Assistant Clerk-Stenographer  
Assistant Clerk-Stenographer  
Assistant Clerk-Stenographer  
Assistant Clerk-Stenographer  
Junior Library Assistant  
Junior Clerk-Stenographer

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PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION

PROJECT STATUS SHEETS  
1940

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RS - NW  
SILVICULTURE  
Harvest Cuttings  
Douglas Fir Region  
(Formerly M-1)

January 1940

SILVICULTURAL STUDIES IN THE DOUGLAS FIR REGION

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Harvest Cuttings, Douglas Fir Region

PURPOSE OF WORK: To work out silvicultural basis for forest cutting practices in the Douglas fir region.

REVIEW OF PAST WORK: Studies have been made on (a) seed production, dissemination and life, (b) physical and biological factors that govern seedling establishment after slash fires, (c) regeneration after crown fires and slash burns, (d) effect of slash burning on the forest soil, (e) survey of the condition of residual stands on partial cutting areas. Results are summarized in U.S.D.A. Bulletins 1200, 1437, 1493, and Circular 486, and "Handbook of Forest Practices", and other publications and manuscripts. In connection with selective logging (e) 37 temporary plots were established on cut-over areas and 13 permanent plots put in on national forest areas to be logged. An analysis was made and progress report prepared for a selectively logged 220-acre privately-owned tract.

ACCOMPLISHMENTS DURING PAST YEAR: Work was continued on the study of shade requirements of Douglas fir seedlings. Further work was done on Technical Bulletin "Natural Regeneration in the Douglas Fir Region." The 13 existing selective logging plots were reexamined, progress reports prepared, and a total of 7 new permanent plots were put in on selective logging national forest sale areas. An analysis was made of the stand structure of a typical Douglas fir tract with reference to selective logging. A study of installment cutting on a 160-acre tract of old-growth fir was undertaken jointly with the Regional Forester's office and a private company, removing a heavy stand in five almost equal cuts. Damage to residual stand and fire hazard rating after each cut were the silvicultural objectives, while economic objectives were to reduce breakage and study the determination of log values in standing trees.

PLANS FOR NEXT YEAR: The monograph on Douglas fir regeneration to be completed. Permanent sample plots reexamined, particularly those in connection with selective logging. Continue seed reproduction, and environmental studies. Study national forest experimental selective logging timber sales in the Douglas fir and spruce-hemlock types. Cooperate in stand improvement studies listed under Stand Improvement-Douglas Fir. Cooperate with Logging Economics Section and the Division of Forest Management (R.O.) on silvicultural phases of selective logging operations.

DATE OF COMPLETION: Continuous.

ASSIGNMENT: Munger, Isaac, and Briegleb.

RS - NW  
SILVICULTURE  
Harvest Cuttings  
Pine Region  
(Formerly M-2)

January 1940

SILVICULTURAL STUDIES IN THE PINE REGION

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Harvest Cuttings, Ponderosa Pine Region

PURPOSE OF WORK: To determine the principles which are basic to good silvicultural practices in the pure pine and mixed conifer forest types in the ponderosa pine region.

REVIEW OF PAST WORK: This study has been a major project since the Station was organized in 1924 and was also worked upon as an administrative study for many years before that by the national forest organization. As a result there are available numerous detailed records and a large number of permanent test plots. These studies are the basis of many forest practices in use.

ACCOMPLISHMENTS DURING PAST YEAR: Two permanent sample plots were re-measured, one on the Deschutes covering 32 acres with 1,406 trees and the other on the Rogue River, of 50 acres, and 1,425 measured trees. Both areas were logged ten years ago. The physical factor measurements obtained during the past three years at the Pringle Falls Experimental Forest were examined and partially analyzed; no field data were taken in 1939. The initial report was prepared on the establishment of 400 plots on the Malheur Forest. This report gives stand and stock tables on the plots which sample some 40,000 acres of ponderosa pine cut over by the maturity selection method. The study is designed to give information on mortality and growth by tree classes.

PLANS FOR NEXT YEAR: The series of plots and permanent mortality strips on the Malheur will be given their annual checking. The Whitman methods of cutting plots, established in 1914, are up for reexamination. The report on establishment of the 520-acre harvest cutting experiments at Pringle Falls will be completed as well as progress reports on the two plots examined in 1939. No new field work is to be undertaken. Effort will be made to analyze all plot data now in the files and otherwise bring the office work on this project up to date. In this connection a ponderosa pine regional problem analysis is to be made and the present working plan for this project is to be rewritten.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Kolbe

RS - NW  
SILVICULTURE  
Stand Improvement  
Douglas Fir  
(Formerly Mt-1)

January 1940

STAND IMPROVEMENT IN THE DOUGLAS FIR REGION

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand Improvement Douglas Fir Region

PURPOSE OF WORK: To determine best methods of stand improvement practices in the Douglas fir region, including thinnings, prunings, liberations, cleanings, and improvement cuttings.

REVIEW OF PAST WORK: The Station maintains 20 and supervises 14 more stand improvement plots in second-growth Douglas fir. Eleven of these thinned plots have been pruned. In addition, 3 plots have been established in second-growth Douglas fir to test the effect of removing different percentages of live crowns in pruning crop trees. A total of 29 stand improvement plots have been established in decadent old-growth stands in order to test the cost and effectiveness of girdling, poisoning and felling of undesirable trees. Cleanings and liberation cuttings have been made in the red alder type. Technical guidance and field demonstrations have been given to the regional CCC stand improvement projects. A pruning time study has been made on one of these projects. A study of limb shedding and occlusion by dissecting large second-growth trees has provided a measure of the rate of natural pruning and quality increment in untreated stands.

ACCOMPLISHMENTS DURING PAST YEAR: Remeasurements were completed on 14 permanent sample plots and the basic computations completed. Seven intensive permanent sample plots were established in the stand improvement area in 97-year-old Douglas fir at Wind River made as a commercial piling sale. The study of limb shedding and occlusion was concluded and reported upon. A study of the time cost of pruning in the Mt. Hebo plantations with CCC's was completed.

PLANS FOR NEXT YEAR: Pruning time studies will be extended to show the range of costs in various stands by various methods. Field instructions and demonstrations will be given CCC foremen and enrollees on regional stand improvement projects. Current examinations of existing plots will be made.

DATE OF COMPLETION: Continuous.

ASSIGNMENT: Briegleb on mensurational phases; Isaac on silvicultural phases.

RS - NW  
SILVICULTURE  
Stand Improvement  
Ponderosa Pine  
(Formerly Mt-2)

January 1940

STAND IMPROVEMENT IN THE PONDEROSA PINE REGION

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand Improvement, Ponderosa Pine Region

PURPOSE OF WORK: To determine best methods of stand improvement practices in the ponderosa pine region, including thinnings, prunings, liberations, cleanings, and improvement cuttings.

REVIEW OF PAST WORK: Eight thinning plots established to test response of young pine to the several forms of thinning. Two liberation plots laid out to measure growth of young ponderosa pine following release from overtopping lodgepole. A 40-acre thinning made in 95-year-old pine at Pringle Falls through sale of sawlogs. Nine thinning study plots established by forest personnel on the national forests. An examination of principal areas on national forests that have received stand improvement treatment has been made, following which the stand improvement section of the regional timber management handbook was revised by this Station. Completed stand improvement time studies have provided a basis for estimating costs on specific areas. A measure of the value increment to be anticipated following pruning has been devised through analysis of growth and log value data. Technical guidance has been given to all regional CCC stand improvement projects.

ACCOMPLISHMENTS DURING PAST YEAR: Stand improvement time studies were made on the Malheur National Forest and on the thinning area at Pringle Falls, testing four methods of pruning. Field instruction of stand improvement technique on seven east-side national forests. Re-measurement of eight thinning study plots at Pringle Falls.

PLANS FOR NEXT YEAR: Continue the stand improvement cutting and plot establishment under way at Pringle Falls. Supplement time study of crop tree pruning and release. Give field instruction to CCC foremen and enrollees on stand improvement work. Establish additional crop tree release and pruning experiments and time studies. Make current examinations of existing plots.

DATE OF COMPLETION: Continuous.

ASSIGNMENT: Briegleb on mensurational phases; Kolbe on silvicultural phases.

RS - NW  
SILVICULTURE  
Silvics  
Phenology  
(formerly B-Ecology,  
Phenology)

January 1940

PHENOLOGY IN THE PACIFIC NORTHWEST

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Silvics, Ecology

PURPOSE OF WORK: To build up a record from representative stations in the forested areas of Washington and Oregon of the time that forest trees, range plants and their associated plants vegetate, bloom, and ripen fruit. This information is useful in collecting seeds of forest and range plants, in determining the range readiness of grazing lands, the fire hazard of herbaceous vegetation, and in other problems of forest and range management.

REVIEW OF PAST WORK: Observations have been made in the Douglas fir region since 1927, and in the ponderosa pine region east of the Cascade Range since 1932. On each national forest in Oregon and Washington there are one or more rangers who record at weekly intervals the progress of plant growth. In addition observations are made on several experimental forests, and on the demonstration forests of the local forest schools.

ACCOMPLISHMENTS DURING PAST YEAR: The older stations were continued as in past years, with several thousand observations recorded there by some 30 observers. A summary record for the first 10-year period was begun in 1938 and is now about half completed. Cone crop reports were issued for seed collections for all the important coniferous species.

PLANS FOR NEXT YEAR: Observations will be continued at all stations. A phenological calendar will be completed giving a summary of the observations made so far in this region. Cone crop reports are to be compiled as in past years.

DATE OF COMPLETION: Continuous.

ASSIGNMENT: Kolbe in cooperation with all national forests, forest schools, and others.



RS - NW  
MENSURATION  
Stand Studies  
(Formerly ME-1, ME-2,  
& ME Growth Cycles)

January 1940

GROWTH AND YIELD IN ALL TYPES

FIELD DIVISION: Forest Management Research

WORK PROJECT: Mensuration

LINE PROJECT: Stand Studies

PURPOSE OF WORK: To increase knowledge of growth and yield of the forest types of the Douglas fir and the ponderosa pine regions.

REVIEW OF PAST WORK: Standard even-aged yield tables for the Douglas fir, spruce-hemlock, and ponderosa pine types and a yield bulletin for selectively cut ponderosa pine stands have been published. Preliminary investigations of growth cycles in ponderosa pine have been made. Sixty permanent growth sample plots in typical even-aged stands have been established and remeasured at 5-year intervals as a check on the normal yield tables. A study of growth in the Douglas fir region has been completed and published as a part of the forest survey. Such a study has been completed for the ponderosa pine regions of Oregon and Washington. Permanent sample plots have been established in partially cut Douglas fir stands. (See project sheet for RS-SILVICULTURE-Harvest Cuttings.)

ACCOMPLISHMENTS DURING THE PAST YEAR: The basic data of Tech. Bull. 407, "Growth in Selectively Cut Ponderosa Pine Forests of the Pacific Northwest", were reanalyzed and an improved technique for estimating increment of such forests was developed. Twenty-five permanent growth study plots in even-aged stands were reexamined and the results computed. One new plot was established. Two articles summarizing findings from sample plots were published. An innovation in growth plot examination this year was the recording of the status of natural pruning in quantitative terms to have some measure of quality growth. Work done on the growth phase of the forest survey, described under that project.

PLANS FOR NEXT YEAR: Sample plot records for second-growth Douglas fir will be analyzed to reveal growth trends in non-normal stands. Rate of natural pruning in second-growth Douglas fir to be analyzed from plot records of last year. Adapt growth predicting technique for selectively cut ponderosa pine to the Keen tree class system. Publish summary of growth in the ponderosa pine regions of Oregon and Washington, as a part of the forest survey project, which see. Make current examinations and computations of existing plots. Growth data for partially cut Douglas fir stands will be analyzed from plots established under RS-SILVICULTURE-Harvest Cuttings. Work on growth cycles of ponderosa pine will be resumed only incidental to other projects.

DATE OF COMPLETION: Continuous.

ASSIGNMENT: Briegleb.

RS - NW  
DENDROLOGY  
Arboreta  
(Formerly part of project  
Fp, Fn, & Fs)

January 1940

TESTS OF EXOTICS AT WIND RIVER ARBORETUM AND ELSEWHERE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Regeneration

LINE PROJECT: Planting

PURPOSE OF WORK: To test for forest planting exotic trees including Northwest species outside their natural range at the Wind River Arboretum and elsewhere.

REVIEW OF PAST WORK: A large amount of planting of exotics has been done on the national forests and records collected as to the results. Commencing in 1912 an arboretum was started at Wind River which has been continually maintained and expanded. It now contains plantations of about 150 conifers. Progress reports on this arboretum were issued in 1932 and 1937. At Cascade Head Experimental Forest and Pringle Falls Experimental Forest small tests of exotics worth trying in these localities have been started. Cooperation has been given other arboreta locally and nationally.

ACCOMPLISHMENTS DURING PAST YEAR: Routine maintenance of the Wind River Arboretum and a small number of acquisitions. Establishment of small plantations of ponderosa pine west of Cascades and noble fir on Olympic National Forest. Routine work in connection with other tests of exotics and cooperation with other arboreta.

PLANS FOR NEXT YEAR: Continuation of routine maintenance and completion of a new map of the Wind River Arboretum. Compilation of all existing material on behavior of exotics in test plantations throughout the region would be highly desirable if time can be found to make it.

DATE OF COMPLETION: Continuous.

ASSIGNMENT: Munger

RS - NW  
REGENERATION  
Nursery and Planting  
(Part of the former  
project Fp, Fn, & Fs)

January 1940

REGENERATION - PLANTING AND NURSERY STUDIES

FIELD DIVISION: Forest Management Research

WORK PROJECT: Regeneration

LINE PROJECT: Planting

PURPOSE OF WORK: To determine the best methods of nursery and planting technique in the Pacific Northwest.

REVIEW OF PAST WORK: An immense amount of work done in the past 30 years, largely centering around the technique of artificially reforestation in the Douglas fir region with Douglas fir. Following classes of work are recognized: (a) Direct seeding tests, in recent years chiefly with small seeded species in the fog belt and in relation to rodents; (b) technique for growing stock at Wind River Nursery, chiefly Douglas fir and secondarily other species; latterly emphasis has been on growing best 2-0 planting stock; (c) best density; (d) methods, season, and sites; (e) damage to plantations by animal cropping; (f) sites suitable for noble and silver fir; (g) practicability of planting alder firebreaks; (h) planting in brush fields, including methods of removing brush.

ACCOMPLISHMENTS DURING PAST YEAR: (a) Direct seeding of alder on Olympic and cooperative study with Biological Survey on seed consumption; (b) current work on Sitka spruce, Port Orford cedar, western hemlock, and silver fir; (c) 15-year progress report prepared; (d) current examination of test plantations and additional tests with Douglas fir, ponderosa pine, noble fir, and western red cedar; (e) current examination of strychnine sprayed trees and cooperation with Biological Survey on rodent eradication; (f) (g) current examination of test plantations; (h) additional test plots established in lands cleared by machinery and by hand; (i) initiation of new phase consisting of treating planting stock with Dowax to check excessive transpiration and increase initial survival.

PLANS FOR NEXT YEAR: Continuation of periodic examinations and reports on all phases of this project. (h) Start of a new series of tests.

DATE OF COMPLETION: (a) 1948; (b) (c) continuous; (d) 1943; (e) continuous; (f) 1940; (g) 1940; (h) 1943; (i) 1940.

ASSIGNMENT: (a) Isaac; (b) Kummel of R.O.; (c) Isaac; (d) (e) (f) Kummel; (g) (h) (i) Kummel and Experiment Station.

RS - NW  
FIRE  
Behavior  
(Formerly Pf-2 Behavior)

January 1940

FIRE STUDIES - BEHAVIOR

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest Fire Protection

LINE PROJECT: Behavior

PURPOSE OF WORK: Studies of the behavior of fire with respect to start and spread as related to weather, topography, fuel, and other factors.

REVIEW OF PAST WORK: This is one of the oldest activities of the Station and includes work done by Hofmann, Munger, Simson, McArdle, and others in addition to the present personnel. Basic studies have been made in the field of fuel and weather relationships and an evolution of important field applications has produced the present fire danger rating scheme, which is still in a state of active growth. This scheme is used by the national forests, national parks, and to some extent by other fire control agencies of the region. It is based on the systematic measurement of danger elements. The measurements, tables, and ratings are conspicuously displayed on a fire danger board which makes use of color psychology. Inexpensive instruments designed and made available by the Station made this development practicable. These instruments or outgrowths from them are now widely used over the entire country. Studies of fire behavior factors have been made on 35 large and small fires. The working plan of this phase of the project was revised in 1937 and since that time more emphasis has been placed on obtaining definite behavior data on small sectors of each fire studied.

ACCOMPLISHMENTS DURING PAST YEAR: Studies were made of the number and location of fire danger stations required for satisfactory sampling of conditions on a ranger district. Fire occurrence was studied. Further tests of fuel sticks were made. Fire danger records were analyzed to obtain information that would aid in integrating the factors. Fire behavior observations were made on seven fires, and the technique of making these observations on small sectors of each fire was improved.

PLANS FOR NEXT YEAR: Review basic information on fire behavior available from recent studies at this and other stations and revise the burning index table for fire danger rating. Continue observations on going fires.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Matthews and Morris.

RS - NW  
FIRE  
Control  
(Formerly Pf-1 Control)

January 1940

FIRE STUDIES - CONTROL

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest Fire Protection

LINE PROJECT: Control

PURPOSE OF WORK: To study the presuppression, detection, suppression, and other aspects of well-rounded forest fire control.

REVIEW OF PAST WORK: An "hour control" analysis of national forest fire records was completed in 1932. Principles of the effect of haze upon visibility of forest fire smokes have been determined and a simple instrument for measuring visibility has been provided for lookout use. Lightning storms as a fire cause have been studied. Time studies have been made of the manpower production of fire control lines to provide a basis for improving fire suppression practice. A technique for making fuel hazard inventories has been developed, and was used when the specifications were drawn up for the fuel-type maps made on all national forests of the region and has also been useful in studying slash disposal problems. Studies of individual fire reports were made from which were developed principles and procedures to be used in planning and coordinating the detection, transportation, and guard-placement facilities so as to most efficiently meet national forest fire control objectives, and parts of a sample fire protection plan were prepared for one ranger district.

ACCOMPLISHMENTS DURING PAST YEAR: At the suggestion of the Fire Protection Committee of the Advisory Council a study of adequate protection for private lands was initiated. A working plan was written and Snohomish County, Washington, was selected as the first sample area to be studied. Time studies of fire fighting were continued.

PLANS FOR NEXT YEAR: High priority will be given to the study of adequate protection of private forest lands and the completion of the Snohomish County unit. Additional counties in Oregon or Washington may be studied. A report will be prepared on the time studies.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Matthews and Morris.



RS - NW  
FIRE  
Effects  
(Formerly  
Pf-3 Effects and  
M-1 Slash Disposal)

January 1940

FIRE STUDIES - EFFECTS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest Fire Protection

LINE PROJECT: Effects

PURPOSE OF WORK: Investigate the effects of fire, particularly damage, but inclusive of closely related beneficial uses such as aids to fire protection and silviculture, especially the use and effectiveness of fire in removing the fuel hazard after logging.

REVIEW OF PAST WORK: Fire data have been analyzed to determine the annual average extent, frequency, and damage of fires in the Douglas fir region. A large number of plots and tracts in clear-cut burned and unburned slash have been under observation since 1927. A progress report on slash disposal and forest management following clear cutting was prepared for publication by Munger and Matthews in 1938. Slash in partially cut stands has been studied recently in connection with other studies of such stands.

ACCOMPLISHMENTS DURING PAST YEAR: The circular on clear-cut slash disposal was revised after re-editing in Washington. Some further studies were made of slash in partial cut stands.

PLANS FOR NEXT YEAR: Revise the instructions and continue field work in partially cut stands.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Munger, Matthews, and Morris.

RS - NW  
GENETICS  
(Formerly part of project  
Fp, Fn, & Fs)

January 1940

TESTS OF REGIONAL RACES OF DOUGLAS FIR AND PINE  
AND OF HYBRID POPLARS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest Genetics

LINE PROJECT: Breeding and Regional Races

PURPOSE OF WORK: To test regional races of ponderosa pine and the progeny of known Douglas fir parentage, and to test in the field hybrid poplars.

REVIEW OF PAST WORK: (a) In 1915 and 1916 six plantations of Douglas fir from 125 separate parents were established. These were examined annually for a number of years and now at 5-year intervals. A progress report on this study was published in 1936 entitled "Growth of Douglas Fir Trees of Known Seed Source" by Munger and Morris; (b) in 1928 plantations of ponderosa pine of 10 regional races were established in six localities, three of them off the national forests in cooperation with forest schools. These have been examined periodically, now on a triennial basis. Striking contrasts between the several races and between sites are apparent; (c) as a measure of cooperation with the Northeastern Forest Experiment Station cuttings of the hybrid poplars they developed have been grown at the Wind River Nursery and outplanted in two series of tests, the first in 1935. The first plantation at Wind River suffered severely because of unfavorable site and the first plantation at Cascade Head from depredations of rodents.

ACCOMPLISHMENTS DURING PAST YEAR: (a) These tests did not come up for examination this year; (b) these tests did not come up for examination this year, and nothing done except resigning the Wind River plantation; (c) one-acre plantations were established at Cascade Head Experimental Forest and on Lady Island and a new set of hybrid poplar cuttings and of native black cottonwood cuttings started in the nursery.

PLANS FOR NEXT YEAR: (a) No work; (b) all plantations to be reexamined; (c) another small plantation of hybrid poplars and black cottonwoods to be made on Lady Island and the old plantations reexamined.

DATE OF COMPLETION: (a) 20 or 30 years hence, longer if expanded; (b) ditto; (c) ditto.

ASSIGNMENT: (a) Munger; (b) Kolbe; (c) Munger.

RR - NW  
GRAZING MANAGEMENT  
Summer Ranges  
Management of Cattle Range

January 1940

DEVELOP IMPROVED METHODS OF MANAGING  
NATIONAL FOREST SUMMER RANGE GRAZED BY CATTLE

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Summer ranges: methods of managing national forest ranges in the mountainous regions of the West.

PURPOSE OF WORK: 98,000 cattle and horses obtain summer forage on national forest ranges east of the summit of the Cascade Mountains in Washington and Oregon. Summer range forage in this region is 40 percent short of being in balance with the supply of spring, fall and winter forage, partly because of a natural lack and partly because of depleted forage conditions on mountainous range lands. It is the objective of this project to work out improved management methods, so as to increase the quality and quantity of forage production on cattle ranges, thereby effecting a better balance between seasonal forage supply.

REVIEW OF PAST WORK: Preliminary working plans for the project were prepared and were approved by the Divisions of Research and of Range Management. A search was conducted to find a suitable range on which to conduct the study.

ACCOMPLISHMENTS DURING PAST YEAR: The Starkey Cattle Allotment on the Umatilla National Forest was selected on which to conduct the study. A range survey and a utilization survey were made of the allotment during 1939.

PLANS FOR NEXT YEAR: Needed developments such as fencing and development of additional watering places will be started in 1940 if possible. General studies on grazing habits and forage preferences of cattle will be carried on until such time as boundary and division fences are constructed to make a study of rotation-deferred versus season-long grazing possible. The allotment will be proposed for an experimental range in order that it may become a center for future range research in the region.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Pickford and Reid.

RR - NW  
GRAZING MANAGEMENT  
Summer Ranges  
Comparison of Range Survey Methods

January 1940

APPRAISAL OF RANGE SURVEY METHODS FOR  
NATIONAL FOREST SUMMER RANGES

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Summer Ranges: methods of managing national forest ranges in the mountainous regions of the West.

PURPOSE OF WORK: To determine which range survey method is most desirable for use on national forest ranges. To compare results from the reconnaissance and the point-observation-plot methods of survey, with and without aerial photography, in order to determine the good points and shortcomings of each, and to evaluate the the methods from the standpoint of accuracy, cost, flexibility, and adaptiveness in formulating sound range management plans.

REVIEW OF PAST WORK: A work plan was prepared jointly with the Washington offices of Range Management, Forest Measurements, and Range Research and with the counsel of all western experiment stations and regions. An area of 27 square miles was selected on the Umatilla National Forest for the work.

ACCOMPLISHMENTS DURING PAST YEAR: The study area was covered with an aerial survey, pictures were obtained and a planimetric type map prepared. A crew of four Forest Service employees and one Soil Conservation Service man, under the direction of Reid, completed the field work during the period May 15-September 15 according to plans. Basic compilation was completed December 31, 1939. Reid, and N. T. Nelson who is assigned to the project from the Soil Conservation Service under memorandum of understanding dated July 1, 1939, are now in Washington, D. C., engaged in analyzing the field data and in writing the report.

PLANS FOR NEXT YEAR: The analysis will be completed and a complete report outlining the findings will be written before June 30, 1940.

DATE OF COMPLETION: June 30, 1940.

ASSIGNMENT: Pickford, Reid, in cooperation with Soil Conservation Service, N. T. Nelson.

RR - NW  
GRAZING MANAGEMENT  
Summer Ranges  
Douglas Fir Cut-Over Lands

January 1940

MANAGEMENT OF SUMMER RANGES IN WESTERN OREGON AND WASHINGTON

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Summer ranges: methods of managing national forest ranges in the mountainous regions of the West.

PURPOSE OF WORK: A study of the grazing possibilities on burned or logged lands in the Douglas fir region.

REVIEW OF PAST WORK: From 1924 to 1935 a detailed study was made of grazed sample plots on logged and burned areas in the Wind River Valley. Results of this phase of the study are covered by various file reports, a J.A.R. article, "Vegetative Changes and Grazing Use on Douglas Fir Cut-Over Lands", by D. C. Ingram, and Research Notes No. 26, "Plant Succession on a Cut-Over, Burned, and Grazed Douglas Fir Area."

ACCOMPLISHMENTS DURING PAST YEAR: None. Project inactive.

PLANS FOR NEXT YEAR: Contingent on availability of funds to finance an intensive study of the economic and ecological aspects of seeding cut-over Douglas fir timber lands to cultivated grass species.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Pickford.

January 1940

DETERMINATION OF STANDARDS OF SATISFACTORY FORAGE UTILIZATION  
ON SUMMER RANGES OF EASTERN OREGON AND WASHINGTON

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Utilization Standards: determination of standards of satisfactory forage utilization on summer ranges of eastern Oregon and Washington.

PURPOSE OF WORK: To determine the degree to which each important forage species and type can be utilized and perpetuate itself, and also to develop methods for measuring this utilization.

REVIEW OF PAST WORK: Forage production may be measured within 10 percent accuracy limits with a minimum of 125 plots. Ocular estimate of use on a series of small plots is the simplest and most accurate means of measuring percent utilization of a forage species.

ACCOMPLISHMENTS DURING PAST YEAR: Tentative use standards developed for green fescue range show: (1) green fescue (*Festuca viridula*) is the key species; (2) the fescue should not be grazed heavier than 50 percent, leaving a 3-inch average stubble; (3) 25 to 50 percent less use is recommended if erosion is present. Earmarks of decline in range condition are: (1) prominence of Letterman's needlegrass, fleecflower, and whorl phlox (*Leptodactylon nuttallii*); (2) green fescue growing on pedestals with soil between fescue plants exhibiting an erosion pavement; (3) young green fescue plants or seedlings absent. Needlegrass-fleecflower range is far below climax soil and vegetation condition and is extremely susceptible to erosion. Safe grazing capacity of this type is not more than one-tenth of that of the ecological climax. Letterman's or Columbia needlegrass, the key species of this type, should not be grazed heavier than 30 percent by sheep; not more than 15 percent if active erosion is observed.

PLANS FOR NEXT YEAR: Utilization studies during 1940 will be centered on cattle range in conjunction with the cattle range management study. A review of existing data on utilization standards supplemented by field work will be made and a handbook will be prepared setting up use standards for important key species and types on national forest ranges of the region.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Pickford, Reid, \_\_\_\_\_.



January 1940

COOPERATIVE WESTERN RANGE SURVEY

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Western Range Survey: Cooperative Western Range Survey.

PURPOSE OF WORK: In cooperation with agencies of the U. S. Departments of Agriculture and Interior who have jurisdiction in range matters or of range lands, from range surveys in Oregon and Washington already made or which may be made, to determine on a county basis (1) acreage and grazing capacity of vegetative types and subtypes and (2) nature, cause and logical solution of major range problems.

REVIEW OF PAST WORK: Project was started March 31, 1937, under memorandum of understanding of that date and terminating March 1, 1938. Field surveys were completed and plans for future land use were prepared for 1-3/4 million acres of range lands in Morrow County (Oregon) and Kittitas County (Washington), in a cooperative project in which eight public agencies actively participated.

ACCOMPLISHMENTS DURING PAST YEAR: With the assistance of the Works Progress Administration, an additional  $2\frac{1}{2}$  million acres of AAA surveys in Oregon has been assembled in tabular form that will be available shortly for distribution to the cooperating agencies. The Inter-agency Committee has continued to function and is proving a valuable means by which to discuss mutual range problems, to coordinate aerial survey activity of the various bureaus, and to maintain a cumulative progress map of range surveys.

PLANS FOR NEXT YEAR: A State WPA project will complete assembly of AAA survey data in tabular form.

DATE OF COMPLETION: June 30, 1940.

ASSIGNMENT: Pickford.

January 1940

MILL PRODUCTION STUDIES

FIELD DIVISION: Forest Products

WORK PROJECT: Timber Harvesting and Conversion

LINE PROJECT: Conversion: Logging and Milling

PURPOSE OF WORK: The development and furtherance of sound milling practice as a means to sustained yield management, better silviculture, and more efficient utilization.

- A. In the Douglas fir region
- B. In the ponderosa pine region

REVIEW OF PAST WORK: A. Grade-production studies completed in several large Douglas fir mills. Reports prepared. Sawing time and grade-production studies conducted in 10 small (under 100 M) Douglas fir mills. Data awaiting analysis.

B. Grade production studies, using a new set of log grades, completed in 7 large ponderosa pine mills. Sawing time studies to determine effect of equipment on costs conducted in 5 small (under 100 M) pine mills. Reports prepared. Data from several mills re-worked for Forest Service appraisals for sales and exchanges.

ACCOMPLISHMENTS DURING PAST YEAR: A. No work done.

B. Grade-production study made in an 80 M capacity mill at Klickitat, Washington. Data compiled, report completed. A large part of the computations for a regional report summarizing procedures and results completed.

PLANS FOR NEXT YEAR: A. Reinstate work in Douglas fir by making one study designed primarily to develop a set of log grades, testing first the adaptability of pine log grades to this species. Analyze sawing-time data already obtained in small mills.

B. Make a check study on logs from another type of timber at Klickitat mill. May be necessary to run another check in Central Oregon to determine effect of changes in log grades. Complete for publication, a regional report summarizing procedures and results of studies. Conduct several sawing-time studies needed to complete analysis of manufacturing procedures.

DATE OF COMPLETION: Continuous project. Regional report under "B" to be completed in 1940.

ASSIGNMENT: Lodewick and Johnson.

RP - NW  
TIMBER CONVERSION  
Utilization

January 1940

SPECIES AND PRODUCTS UTILIZATION

FIELD DIVISION: Forest Products

WORK PROJECT: Timber Harvesting and Conversion

LINE PROJECT: Wood Use Development: Species and Products Utilization

PURPOSE OF WORK: Analysis of the factors affecting the use of minor species and so-called minor products.

- A. Minor species utilization
- B. Minor products utilization

REVIEW OF PAST WORK: A. Data accumulated and published on red alder, bigleaf maple, Oregon white oak, and black cottonwood. Miscellaneous data collected for other species. B. Measurements made and reports published on solid contents of pulpwood and on yields for trees of different sizes. Plans completed for cooperation with Forest Products Laboratory on cascara bark yields, production and utilization.

ACCOMPLISHMENTS DURING PAST YEAR: A. A few data collected. B. Nothing done.

PLANS FOR NEXT YEAR: A. and B. Continue collection of data as and if funds and personnel permit.

DATE OF COMPLETION: Continuous project.

ASSIGNMENT: Johnson and Lodewick

RP - NW  
WOOD PRESERVATION  
Service Records

January 1940

STUDIES ON THE PROPERTIES OF WEST COAST WOODS

FIELD DIVISION: Forest Products

WORK PROJECT: Seasoning and Physical Properties

LINE PROJECT: Properties of West Coast Woods

PURPOSE OF WORK: To carry on investigations in cooperation with and supplementing those of the Forest Products Laboratory in wood durability and preservation.

REVIEW OF PAST WORK: Work plans completed. Data on all arsenic-paste treated Forest Service lines in R-6 compiled. Eleven lines established for periodic examination. Data on all new installations of arsenic-treated lines kept current. Current inspections of experimental lines made.

ACCOMPLISHMENTS DURING PAST YEAR: Inspection of seven lines made. Two additional experimental lines containing alternate treated and untreated poles tagged and described.

PLANS FOR NEXT YEAR: Inspect Oregon lines. Keep new pole installation data current.

DATE OF COMPLETION: Continuous project.

ASSIGNMENT: Lodewick.

RP - NW  
WOOD STRUCTURE  
Identification

January 1940

STRUCTURE AND IDENTIFICATION

FIELD DIVISION: Forest Products

WORK PROJECT: Structure and Growth

LINE PROJECT: Structure and Identification of Native Woods

PURPOSE OF WORK: To carry on investigations in cooperation with and supplementing those of the Forest Products Laboratory in identification of woods and fibers.

REVIEW OF PAST WORK: Routine identifications. Articles on wood and wood fiber identification published.

ACCOMPLISHMENTS DURING PAST YEAR: Routine identifications.

PLANS FOR NEXT YEAR: Continue routine.

DATE OF COMPLETION: Continuous project.

ASSIGNMENT: Lodewick.

RE - NW  
STATISTICS

January 1940

STATISTICAL STUDY OF PRODUCTION: USE  
AND PRICE TRENDS OF P.N.W. FOREST PRODUCTS

FIELD DIVISION: Forest Products

WORK PROJECT: Forest Products Statistics

LINE PROJECT: Forest Products Statistics: Statistical study of production; use and price trends of P.N.W. forest products.

PURPOSE OF WORK: To collect, summarize, and distribute all available statistics on the forest products of Oregon and Washington.

A. Minor products

B. Census

REVIEW OF PAST WORK: A. Report on minor forest products, their production and use completed in 1931. Additional and supplementary data compiled since then. Price charts for chemical forest products prepared annually. B. Annual census of lumber, lath, shingle, and log production for past years completed. Report on distribution of Oregon and Washington lumber 1920-34 published. Similar report for 1936 released. Annual log and shingle prices compiled annually.

ACCOMPLISHMENTS DURING PAST YEAR: A. General and supplementary information on minor products collected. Price charts kept current. B. Collected lumber, lath, shingle, and log census for 1938 in cooperation with Bureau of the Census. 1938 log export data tabulated and released. Log and shingle prices for 1938 prepared and released.

PLANS FOR NEXT YEAR: A. Continue collection of data as time and funds permit. B. Conduct 1939 census.

DATE OF COMPLETION: A and B. Continuous projects.

ASSIGNMENT: A and B. Johnson.



RE - NW  
FOREST SURVEY  
Inventory

January 1940

FOREST INVENTORY

FIELD DIVISION: Forest Survey

WORK PROJECT: Survey of forest resources, present and future requirements.

LINE PROJECT: Inventory

PURPOSE OF WORK: To make an inventory of the existing forest resources of the North Pacific Region in terms of area occupied by forest-cover types and of timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands.

REVIEW OF PAST WORK: Field work commenced in the Douglas fir region 1930 and was completed in 1933. In the ponderosa pine region work commenced in 1933 and was completed in 1936. Total area covered 51 million acres. State lithographed type maps on a scale of  $\frac{1}{4}$  inch to the mile and inch-to-the-mile county type maps published for the entire region, making a total of 75 maps.

ACCOMPLISHMENTS DURING PAST YEAR: See project sheet "Interpretation, Analysis, and Preparation of Reports."

PLANS FOR NEXT YEAR: See project sheets "Interpretation, Analysis, and Preparation of Reports" and "Keeping Findings Current."

DATE OF COMPLETION: Completed. See project sheet "Keeping Findings Current."

ASSIGNMENT: None.

RE - NW  
FOREST SURVEY  
Growth and Yield

January 1940

GROWTH AND YIELD

FIELD DIVISION: Forest Survey

WORK PROJECT: Survey of forest resources, present and future requirements.

LINE PROJECT: Growth and yield.

PURPOSE OF WORK: To determine current and potential growth on forest land of North Pacific region.

REVIEW OF PAST WORK: Field work completed for the Douglas fir region in 1934 and ponderosa pine region in 1937. Computations completed, Douglas fir region 1936, ponderosa pine region 1939.

ACCOMPLISHMENTS DURING PAST YEAR: Periodic growth computations for ponderosa pine region completed.

PLANS FOR NEXT YEAR: See project sheet "Interpretation, Analysis, and Preparation of Reports."

DATE OF COMPLETION: Completed.

ASSIGNMENT: None.

RE - NW  
FOREST SURVEY  
Drain

January 1940

DRAIN

FIELD DIVISION: Forest Survey

WORK PROJECT: Survey of forest resources, present and future requirements.

LINE PROJECT: Depletion

PURPOSE OF WORK: To determine the rate at which the forest resources of the North Pacific region are being depleted through cutting and through loss from fire, insects, disease, and other causes.

REVIEW OF PAST WORK: Cutting depletion data for the period 1925-33, inclusive, for the Douglas fir region and for 1925-36, inclusive, for the ponderosa pine region were compiled for inclusion in the regional reports from log census and minor forest products data collected by the Division of Forest Products. Fire records and insect depletion data were analyzed for inclusion in regional survey reports. Completed 1938.

ACCOMPLISHMENTS DURING PAST YEAR: See project sheet "Interpretation, Analysis, and Preparation of Reports."

PLANS FOR NEXT YEAR: See project sheets "Interpretation, Analysis, and Preparation of Reports" and "Keeping Findings Current."

DATE OF COMPLETION: Completed.

ASSIGNMENT: None.

January 1940

REQUIREMENTS

FIELD DIVISION: Forest Survey

WORK PROJECT: Survey of forest resources, present and future requirements.

LINE PROJECT: Requirements

PURPOSE OF WORK: As a part of the national survey to determine present and prospective requirements for forest products.

REVIEW OF PAST WORK: Completed studies of urban dwelling and garage requirements, urban repairs and alteration requirements, and farm fencing requirements. Field work on farm building requirements complete, report commenced.

ACCOMPLISHMENTS DURING PAST YEAR: Progress on farm buildings report.

PLANS FOR NEXT YEAR: Complete farm buildings requirement report.

DATE OF COMPLETION: 1940

ASSIGNMENT: Division of Forest Products; Lodewick.

RE - NW  
FOREST SURVEY  
General

January 1940

INTERPRETATION, ANALYSIS, AND PREPARATION OF REPORTS

FIELD DIVISION: Forest Survey

WORK PROJECT: Survey of forest resources, present and future requirements.

LINE PROJECT: Interpretation, analysis, and preparation of reports.

PURPOSE OF WORK: To analyze the findings of inventory, growth, and drain phases of the forest survey and correlate these data with other economic data to make available to public and private agencies basic facts for formulating principles, policies, and plans for sound management of the region's forest resources.

REVIEW OF PAST WORK: Basic inventory statistics published by county, State, and region for both Douglas fir and ponderosa pine regions in 65 reports. Growth data published for Douglas fir region, manuscript of comprehensive Douglas fir report completed in final draft, now on way to printer. Manuscript of ponderosa pine region report complete in first draft.

ACCOMPLISHMENTS DURING PAST YEAR: Analyzed growth, depletion, sustained yield and timber supply data for ponderosa pine region and completed first draft of regional report. Published revised inventory statistics for Pacific, Pierce, and Snohomish Counties. Made minor changes in Douglas fir region report manuscript. Prepared report for State of Washington.

PLANS FOR NEXT YEAR: Circulate manuscript ponderosa pine report for local review. Consider suggestions made, correct, and forward to Washington. Publish ponderosa pine growth data in mimeograph report. Publish revised county inventory statistics for 6 counties in Douglas fir region. Prepare unit report for Grays Harbor unit using revised data. Arrange for publication Washington State report.

DATE OF COMPLETION: Ponderosa pine growth report March 1940. Regional report April 1940. State report March 1940. Grays Harbor unit report November 1940.

ASSIGNMENT: Cowlin, Briegleb, Moravets, and Buell.

RE - NW  
FOREST SURVEY  
General

January 1940

KEEPING FINDINGS CURRENT

FIELD DIVISION: Forest Survey

WORK PROJECT: Survey of forest resources, present and future requirements.

LINE PROJECT: Keeping findings current

PURPOSE OF WORK: To maintain the currency of the survey findings and thus be able to provide constantly up-to-date information on forest resources of the North Pacific Region.

REVIEW OF PAST WORK: Original inventory of Clatsop, Grays Harbor, Columbia, Pierce, Pacific, and Snohomish Counties revised and results published.

ACCOMPLISHMENTS DURING PAST YEAR: Published reports for Pierce, Pacific, and Snohomish Counties. Prepared and published revised type maps for Clallam, Snohomish, Washington, and Coos Counties. Completed field work in Clallam, West Jefferson, Cowlitz, Thurston, Washington, and Lewis Counties. Office compilation completed for Coos and Thurston Counties and partly completed for Clallam, Washington, and Cowlitz Counties.

PLANS FOR NEXT YEAR: Revise inventory by field examination for 6 counties in the Douglas fir region.

DATE OF COMPLETION: Field work October 1940. Office work April 1941.

ASSIGNMENT: Cowlin, Moravets, Buell, and assistants.



RE - NW  
NEW PUBLIC DOMAIN  
Oregon and Washington

January 1940

TAX DELINQUENCY AND REVERSION TO PUBLIC OWNERSHIP OF FOREST LAND

FIELD DIVISION: Forest Economics

WORK PROJECT: New Public Domain

LINE PROJECT: New Public Domain: investigations of the causes, extent, and trends of tax delinquency and reversion to public ownership of forest lands, relation to ownership and to forest practice, and the formulation of remedial measures.

PURPOSE OF WORK: (a) To determine the effects, causes and possible cures of unstable forest land ownership and (b) to apply findings to representative cases.

REVIEW OF PAST WORK: Extent of tax delinquency in 18 representative forest counties of the Douglas fir region determined and progress reports published. Advanced writing of general report for Douglas fir region covering results of investigations to date. Cooperated broadly with regional, State, county and other agencies on land classification, plans for handling tax delinquent and forfeited forest lands, and analysis of proposed remedial measures.

ACCOMPLISHMENTS DURING PAST YEAR: Progressed with writing report and continued cooperation.

PLANS FOR NEXT YEAR: (1) Complete general report for Douglas fir region; (2) complete detailed analysis on the relation of forest cover to tax delinquency; (3) complete digest of tax collection and related laws of Oregon and Washington affecting owners of forest property; (4) write report of zoning principles as related to forest lands; (5) initiate studies of economic factors and relationships affecting use of logged-off tax-forfeited lands in Douglas fir region for forest and grazing uses; (6) work in ponderosa pine region to remain closed.

DATE OF COMPLETION: Continuing project. Indefinite.

ASSIGNMENT: Wilson.

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RE - NW  
FINANCIAL ASPECTS  
Industrial Forestry  
Douglas Fir

January 1940

SELECTIVE TIMBER MANAGEMENT IN DOUGLAS FIR

FIELD DIVISION: Forest Economics

WORK PROJECT: Private Forestry

LINE PROJECT: Financial Aspects: selective timber management in Douglas fir

PURPOSE OF WORK: Develop through production-cost studies and financial analyses improved methods of cutting Douglas fir and associated species that are economically sound and technically desirable from forest land-use standpoint.

REVIEW OF PAST WORK: First phase completed in 1933 with publication of a bulletin by Brandstrom entitled "Analysis of Logging Costs and Operating Methods in the Douglas Fir Region." Second phase completed in 1935 and published in the form of a comprehensive report, "Selective Timber Management in the Douglas Fir Region", by Kirkland and Brandstrom, followed by application of study conclusions in the form of experimental cuttings on both national forest and private lands.

ACCOMPLISHMENTS DURING PAST YEAR: Cooperation, to the extent time has permitted, with the Simpson Logging Co., the West Fork Logging Co., the Crown Zellerbach Corp., the Weyerhaeuser Timber Co., and the Regional Office in connection with studies and experiments in selective cutting on both private and federal lands.

PLANS FOR NEXT YEAR: (1) To conduct further studies and experiments in cooperation with the Regional Office and with private operations with whom satisfactory arrangements can be made; (2) to undertake, if time and money become available, a series of time and cost studies of logging to bring information up-to-date and to check on methods studied in 1931 and 1932.

DATE OF COMPLETION: (1) Indefinite; (2) 1941.

ASSIGNMENT: Brandstrom and temporaries (if available).

RE - NW  
FINANCIAL ASPECTS  
Industrial Forestry  
Ponderosa Pine

January 1940

SELECTIVE TIMBER MANAGEMENT IN PONDEROSA PINE

FIELD DIVISION: Forest Economics

WORK PROJECT: Private Forestry

LINE PROJECT: Financial aspects: selective timber management in ponderosa pine.

PURPOSE OF WORK: Develop through production-cost studies and financial analysis improved methods of cutting ponderosa pine that are economically sound and technically desirable from forest land-use standpoint.

REVIEW OF PAST WORK: Project began in 1935 with a series of time and cost studies of logging in eight different operations in eastern Oregon. Then followed a series of comprehensive case studies of selective timber management among which the Hines study, the Kinzua study, and the Ewauna study were the most important. Later came application of study results in the Hines study case and in the form of demonstration cuttings at the Pringle Falls Experimental Forest and elsewhere.

ACCOMPLISHMENTS DURING PAST YEAR: Cooperation with Regional Office in connection with timber appraisals based on data collected in connection with the aforementioned case studies. Analysis of the effect of price changes on the order of precedence in selecting trees for cutting based on 700 sample trees at Pringle Falls.

PLANS FOR NEXT YEAR: Prepare for publication, in cooperation with other Station divisions, comprehensive bulletin on selective timber management in ponderosa pine, embodying the findings and conclusions of the studies conducted from 1935 to the present. Cooperation with Regional Office in timber appraisal work based on findings of the studies. Continuation and analysis of Pringle Falls cutting experiments and further study of the effect of price changes on the order of precedence in selecting trees for cutting.

DATE OF COMPLETION: Preparation of aforementioned bulletin to be completed during 1940. Date of completion of other work indefinite.

ASSIGNMENT: Brandstrom.

RE - NW  
FINANCIAL ASPECTS  
Utilization Methods and Costs

January 1940

INVESTIGATION OF COSTS OF MOTOR TRUCK HAULING  
IN OREGON AND WASHINGTON

FIELD DIVISION: Forest Economics

WORK PROJECT: Private Forestry

LINE PROJECT: Financial Aspects: investigation of costs of motor truck hauling in Oregon and Washington

PURPOSE OF WORK: To collect and analyze data on costs and methods of hauling logs by motor trucks operated on public and private roads, and to study their effect on logging methods and forest management. Developments in motor truck log transportation are bringing about revolutionary changes in the woods operations of Oregon and Washington which are of extraordinary significance in forest management.

REVIEW OF PAST WORK: Initial project completed by Rapraeger in 1932, with publication of various trade-journal articles in 1933 and 1934. Project resumed to a limited extent in 1936 with collection of data on four truck operations in western Oregon.

ACCOMPLISHMENTS DURING PAST YEAR: None, owing to lack of personnel.

PLANS FOR NEXT YEAR: Contingent on availability of time and personnel, to collect and analyze field data and to prepare reports and trade-journal articles for dissemination of findings.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Brandstrom.

January 1940

MACHINERY DESIGN

FIELD DIVISION: Forest Economics

WORK PROJECT: Private Forestry

LINE PROJECT: Financial Aspects: Machinery Design

PURPOSE OF WORK: To aid in the development of logging machinery and methods that would contribute toward better forest management, specifically toward reduction of timber breakage and of damage to residual stands, reproduction, or the land, and toward greater flexibility and selectivity in logging. Motorization of logging, as represented by recent rapid advances and developments in the use of trucks and tractors has prepared a fertile field for adaptation of machinery to the needs of forestry.

REVIEW OF PAST WORK: Project proposed and accepted at 1937 investigative meeting and assigned to three man steering committee, two from the Regional Office and one from the Experiment Station. Forest Service Equipment Laboratory engineers were engaged by committee to study field conditions under which tractor logging is done, and to prepare designs of a logging tractor adapted for carrying large loads without the use of trailer (arch). As a part of this work design and stress calculations were made of complete logging-tractor unit to develop correct proportions of width, length and height; and detailed designs were drawn for a new type compound-planetary-steering clutch and for a special transmission.

ACCOMPLISHMENTS DURING PAST YEAR: (1) Construction of a small office model of the proposed logging tractor, built to exact scale and provided with special roller platforms and recording devices, which was used for checking tipping action, drawbar pulls on various grades, tractive effort and other factors. (2) Assembling of complete power transmitting unit and its subjection to thorough tests before proceeding with final detailed design. (3) Completion of detail design of all tractor parts in the transmission steering clutch, and yarding drum.

PLANS FOR NEXT YEAR: (1) Completion of detailed plans for the entire track system. (2) Actual construction and assembling of the entire tractor-arch unit, the completion of which, however, is dependent upon sufficiency of present allotments, which may prove inadequate.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Brandstrom (chairman of committee); Wright and Flynn of Regional Office.

January 1940

ADAPTION OF LOCAL GOVERNMENT TO FOREST LAND USE AND STUDIES  
OF EXISTING AND PROPOSED LOCAL TAX LAWS APPLICABLE TO FORESTS

FIELD DIVISION: Forest Economics

WORK PROJECT: Forest Taxation

LINE PROJECT: (1) Local government adaption: adaption of local government to forest land use. (2) Forest taxation: investigation of the effects of tax laws, methods, and practices upon forestry; and the formulation of sound principles and methods of forest taxation.

PURPOSE OF WORK: (1) To study the effect of the local government organization and debt on the absolute burden and stability and predictability of taxes on forests, and on the use of forest land; to devise plans for rationalizing and adapting local government areas and organization to the requirements of a forest area in order to overcome instability in tax base due to cutting of timber and forfeiture or public acquisition of forest land, to stabilize property taxes on forests, to promote efficiency, to preserve and strengthen local self-government, and in general to reduce some of the adverse effects of local government requirements on forestry. (2) To study the present and probable effects of local government taxes and of special forest tax plans and proposed State tax legislation on forest perpetuation and management; to devise methods and plans for improving the operation of present tax laws in the interests of forestry.

REVIEW OF PAST WORK: Project was begun in 1937 as a detailed application to the region of the principles and recommendations in the formal report of the Forest Taxation Inquiry. Studies in local government have been completed and reports written for three western Washington counties.

ACCOMPLISHMENTS DURING PAST YEAR: Prepared public ownership, assessed value, and local government organization maps of Stevens County, Washington; and studied the possibilities of local government adaption. Made a statistical study of the Reforestation Laws of Oregon, Washington, and Idaho. At the California Station, took part in preparing that part of a land use study of the Northern Sierra Nevada foothills having to do with local government and property tax problems bearing on land use.

PLANS FOR NEXT YEAR: Finish local government adaption studies in 5 selected Washington counties and prepare for publication a State report based on findings in the 5 selected counties. Reexamine program to decide whether to conduct a similar study in Oregon. Study effects of fire patrol taxes and assessments on private forestry.

DATE OF COMPLETION: Continuing.

ASSIGNMENT: DeVries

January 1940

PRELIMINARY EXAMINATIONS

FIELD DIVISION: Flood Control

WORK PROJECT: Flood Control Surveys

LINE PROJECT: Preliminary Examinations

PURPOSE OF WORK: Preliminary reports are made to determine the need and nature of surveys to obtain fundamental data upon which to base a program of land use best suited to the control of run-off and the prevention of floods.

REVIEW OF PAST WORK: This was a new project in 1937. The work to date has consisted almost entirely of the preparation of preliminary reports, joint public flood-control hearings held in cooperation with the Army Engineers and in developing work outlines for surveys upon two watersheds.

ACCOMPLISHMENTS DURING PAST YEAR: Conferences with representatives of the BAE and SCS to develop plans for a more efficient functioning of the field coordinating committees. Outgrowth of these meetings was assignment of two BAE men to the Northwest for flood control work. The headquarters of these men will be at the Experiment Station. In cooperation with the BAE and SCS preliminary flood control reports for the Nooksack and Willamette Rivers in the Northwest and the Tanana River in Alaska were completed. Work outlines which are detailed plans for watershed surveys were prepared for the Walla Walla and Willamette River drainages. Joint public hearings on the Skokomish and Siuslaw Rivers and Moses Coulee were held in cooperation with the Army Engineers.

PLANS FOR NEXT YEAR: Complete the Puyallup, Moses Coulee, John Day, Yakima, Willow Creek, and Umatilla reports. It is hoped to start flood control surveys on the Walla Walla and Willamette watersheds but this depends upon the allotment of funds for these projects by the Washington committee.

DATE OF COMPLETION: See above.

ASSIGNMENT: Chapler and Bolles in cooperation with representatives of the BAE and SCS.



